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RFI Work Plan for Operable Unit 1136

Environmental Restoration Program

May 1994

A Department of Energy
Environmental Cleanup Program

FINAL DRAFT

Los Alamos
NATIONAL LABORATORY

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EXECUTIVE SUMMARY

Purpose

The primary goals of Resource Conservation and Recovery Act (RCRA) facility investigations (RFIs) at Los Alamos National Laboratory (the Laboratory) are to determine the nature and extent of releases of hazardous waste or hazardous constituents from solid waste management units (SWMUs) and to determine the need for corrective measures studies (CMSs). As the first step toward meeting these goals, the primary purposes of this particular Phase I RFI work plan are to determine the presence of contaminants of concern at specific potential release sites (PRSs) in Operable Unit (OU) 1136 and to indicate the PRSs that are proposed for no further action (NFA) or deferred action based on archival or historial information. Secondly, this document satisfies part of the regulatory requirements contained in the Laboratory's permit to operate under RCRA.

OU 1136 includes Technical Area (TA) 43, which is located in Los Alamos County. There are nine PRSs in OU 1136, which are located on land owned by the US Department of Energy (DOE).

The Hazardous and Solid Waste Amendments (HSWA) Module, Module VIII of the permit, and schedules of the permit issued by the US Environmental Protection Agency (EPA) address potential corrective action requirements for SWMUs at the Laboratory. These permit requirements are addressed by the DOE's Environmental Restoration (ER) Program at the Laboratory.

This document describes the initial sampling plans that will be followed to implement the RFI at OU 1136, and, together with other work plans submitted to the EPA, meets the requirement set forth in the HSWA Module to address a cumulative percentage of the Laboratory's SWMUs in RFI work plans in 1994.

Installation Work Plan

The HSWA Module required the Laboratory to prepare an installation work plan (IWP) to describe the Laboratory-wide system for accomplishing the RFI, CMSs, and corrective measures. This requirement was satisfied by submitting the Installation Work Plan for Environmental Restoration to the EPA in November 1990. That document is updated annually, and the most recent revision (Revision 3) was published in November 1993. The IWP identifies the Laboratory's PRSs, describes their aggregation into 24 OUs, and presents the Laboratory's overall management plan and technical approach for meeting the requirements of the HSWA Module. When information relevant to this work plan is provided in the IWP, the reader is referred to the appropriate version of that document.

Both the IWP and this work plan address radioactive materials and other hazardous substances not subject to RCRA. Sites that were not defined as SWMUs but potentially contain hazardous substances, including non-RCRA materials, are called areas of concern (AOCs). The term PRS is the generic name for both SWMUs and AOCs.

The work plan includes sites that are not identified in the HSWA Module and are outside the regulatory scope of the operating permit. These units are included to ensure that all potential environmental problems at each OU are investigated and to present to the public and the regulators a unified plan that addresses all potential environmental problems on site. Inclusion of these sites in the work plan does not confer additional regulatory responsibility or authority for these sites to the regulators and does not bind the Laboratory to additional commitments outside the scope of the permit. The Laboratory will consider all comments received on this work plan.

Background

OU 1136 is located within the northwestern section of the Laboratory complex. It encompasses a portion of Los Alamos Canyon extending from the south rim to points on the mesa north of the canyon. The western boundary is near the Los Alamos skating rink; the eastern boundary lies approximately 1.2 mi east of the rink. Omega Bridge (TA-0-40) and DOE's Los Alamos Area Office (TA-43-39) are located within the unit boundary.

TA-43 is the only area in OU 1136 in which experiments are currently conducted and is the location of all of that OU's PRSs. It is on the north rim of Los Alamos Canyon, bounded on the north and west by Diamond Drive and on the east by the parking lot between the Health Research Laboratory (HRL) Building (TA-43-1) and the Los Alamos Medical Center. The area is paved except for a maintained lawn and natural vegetation along the canyon edge.

TA-43 was established in 1953 with the opening of the HRL Building where the former Health (H) Division conducted biomedical and industrial hygiene research. The original emphasis involved both basic and applied research to assess health effects of radiation and materials associated with energy production. With the completion of the occupational health building (TA-59-1) in 1966, industrial hygiene activities were moved out of TA-43. TA-43 has since been devoted to biomedical research conducted by Life Sciences (LS) Division, which conducts diverse experiments at the molecular, cellular, and whole-body levels.

Technical Approach

For the purposes of designing and/or implementing the sampling and analysis plans described in this work plan, the PRSs are discussed individually. This work plan presents the description and operating history of each PRS, together with an evaluation of the existing data, in order to develop a preliminary conceptual exposure model for the site. For some sites, NFA can be proposed on the basis of this review; these sites are discussed in Chapter 6 of this work plan. For currently active sites, this review is sufficient to determine that investigation and remediation (if required) may be deferred until the site is decommissioned; these sites are also discussed in Chapter 6. The remaining sites, for which RFI fieldwork is proposed, are discussed in Chapter 5.

The technical approach to field sampling followed in this work plan is designed to refine the conceptual exposure models to a level of detail sufficient to support a screening assessment decision for each PRS. A preliminary baseline risk assessment may also be performed; however, if the data are insufficient to support a baseline risk assessment, then further data will be collected as part of Phase II for this RFI. A phased approach to the RFI is used to ensure that any environmental impacts associated with past and present activities are investigated in a manner that is cost-effective and that complies with the HSWA Module. This phased approach permits intermediate data evaluation with opportunities for additional sampling if required. Furthermore, it is a streamlined approach that attempts to apply

RCRA guidance to "characterize nature, extent, direction, rate, movement, and concentration of releases" in the context of site-specific decisions. Thus, a screening assessment for a site with potential surface soil contamination is put in the context of a decision to determine if the site needs further characterization or can be recommended for NFA. The operational guidance for this decision is to compare the observed maximum concentration of potential contaminants to their screening action levels (SALs).

At PRSs for which there are no existing data and little or no historical evidence that a release has occurred, the Phase I sampling strategy for OU 1136 will focus on determining the presence or absence of hazardous and radioactive contaminants. If contaminants are detected at concentrations above conservative SALs, a baseline risk assessment may be required or a voluntary corrective action (VCA) may be proposed. The baseline risk assessment would be used to determine the need for a CMS or VCA. If necessary, RFI Phase II sampling will be undertaken to characterize the nature and extent of the release in more detail to support a risk-based decision.

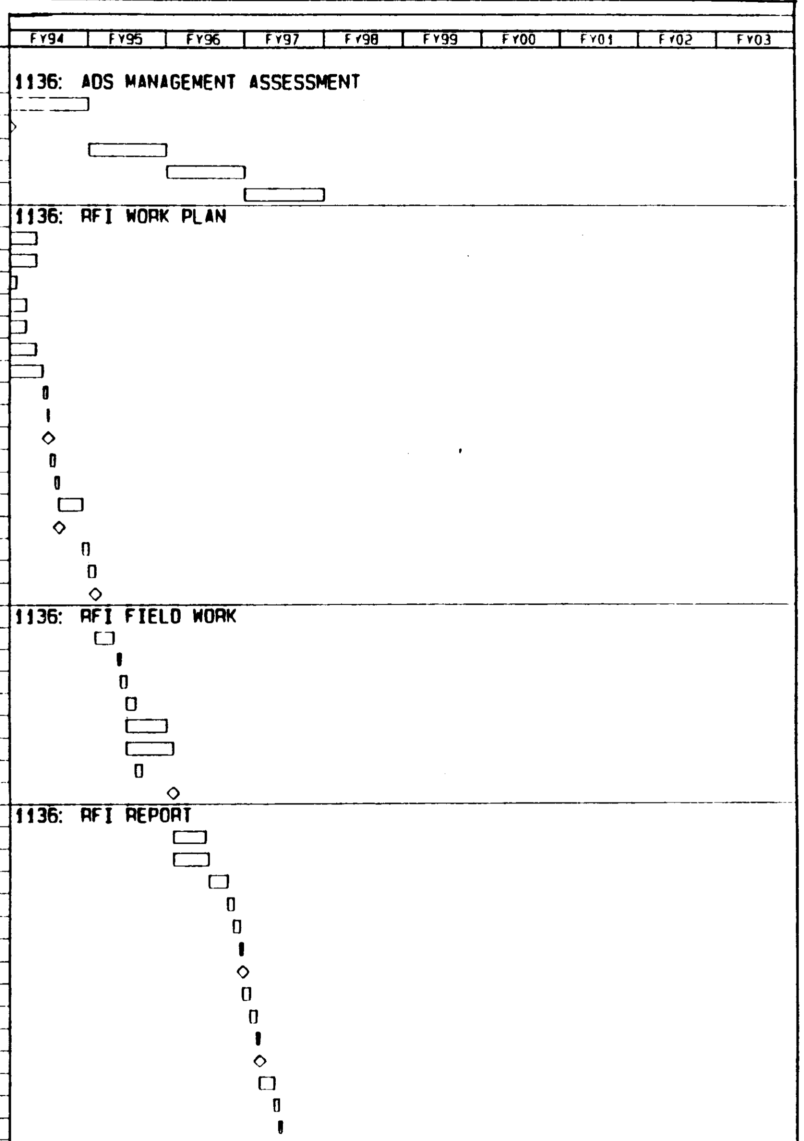
To ensure that relevant, quality data are collected, data quality objectives to support the required decisions are developed for the RFI Phase I sampling and analysis plans. Fieldwork for many sites includes field surveys and field screening of samples. Analyses will be performed in fixed analytical laboratories.

This work plan includes five annexes that consist of project plans corresponding to the program plans in the IWP: project management, quality assurance, health and safety, records management, and public involvement.

Schedule, Costs, and Reports

The RFI fieldwork described in this document is scheduled to be completed in one year (Figure ES-1). A single phase of fieldwork is expected to be sufficient to complete the RFI for all PRSs; however, a second phase will occur if warranted by the results of the first phase, in which case additional field activities will be defined in supplemental work plans deliverable in

ACTIVITY ID	ACTIVITY DESCRIPTION			CAL ID	EARLY START	EARLY FINISH	ORIG DUR
	1136: ADS MANAGEMENT ASSESSMENT						
220110904	1136 MANAGE ADS DURING FY-94		(LOE)	1	1OCT93	30SEP94	249
22011M000	1136 START FY94 ACTIVITIES			1	1OCT93		0
220110905	1136 MANAGE ADS DURING FY-95		(LOE)	1	3OCT94	29SEP95	248
220110906	1136 MANAGE ADS DURING FY-96		(LOE)	1	2OCT95	30SEP96	249
220110907	1136 MANAGE ADS DURING FY-97		(LOE)	1	1OCT96	30SEP97	249
	1136: RFI WORK PLAN						
220120025	1136 COMPL DETERMINE DATA NEEDS	RFI WP		1	1OCT93	1FEB94	80
220120030	1136 COMPL DEVELOPMENT SMPLG PLAN	RFI WP		1	1OCT93	1FEB94	80
220120050	1136 DEVELOP HEALTH & SAFETY PLAN	RFI WP		1	1OCT93	29OCT93	20
220120062	1136 NM RVW/APPR ARCH/BIO REPORT	RFI WP		1	1OCT93	15DEC93	50
220120063	1136 USFW RVW/APPR ARCH/BIO RPT	RFI WP		1	1OCT93	15DEC93	50
220120070	1136 COMPL ESTAB DATA QUAL OBJECT	RFI WP		1	1OCT93	1FEB94	80
220120100	1136 COMPL DEVELOP INTERNAL DRAFT	RFI WP		1	1OCT93	3MAR94	101
220120106	1136 INFORMAL REVIEW (INTERNAL)	RFI WP		1	8MAR94	25MAR94	14
220120110	1136 INC RVW COMM/ISSUE DOE DRAFT	RFI WP		1	28MAR94	31MAR94	4
22012M115	1136 DOE DRAFT COMPL 3RD DRAFT	RFI WP		1		31MAR94	0
220120120	1136 DOE REVIEW	RFI WP		1	11APR94	29APR94	15
220120125	1136 INCORPORATE DOE COMMENTS	RFI WP		1	2MAY94	19MAY94	14
220120130	1136 ISSUE WP AND EPA REVIEW	RFI WP		1	20MAY94	6SEP94	75
22012M130	1136 EPA DRAFT OF RFI WORK PLAN COMPLETE			1	20MAY94		0
220120146	1136 RESPOND/INCORP EPA COMMENTS	RFI WP		1	7SEP94	4OCT94	20
220120150	1136 COMPL/ISSUE FINAL WORK PLAN	RFI WP		1	5OCT94	2NOV94	20
22013M150	1136 RFI WORK PLAN COMPLETE			1		2NOV94	0
	1136: RFI FIELD WORK						
220131001	1136 WRITE CONTRACTS/PLAN FW	RFI PH1		1	3NOV94	27JAN95	55
220131000	1136 MOBILIZE	RFI PH1		4	16FEB95	1MAR95	10
220131202	1136 TA-43 CONDUCT SITE SURVEY	RFI PH1		2	2MAR95	29MAR95	20
220131210	1136 TA-43 CONDUCT SITE SAMPLING	RFI PH1		2	30MAR95	10MAY95	30
220131402	1136 TA-43 CONDUCT SMPL ANALYSIS	RFI PH1		1	30MAR95	20OCT95	130
220131602	1136 TA-43 DATA ASSESSMENT	RFI PH1		1	30MAR95	31OCT95	150
220131800	1136 DEMOBILIZE	RFI PH1		1	11MAY95	8JUN95	20
22013M500	1136 RFI FIELD WORK COMPLETE			1		31OCT95	0
	1136: RFI REPORT						
220140290	1136 FACILITY INVESTIGATION	RFI RPT		1	1NOV95	29MAR96	100
220140295	1136 INVESTIGATION ANALYSIS	RFI RPT		1	1NOV95	12APR96	110
220140300	1136 PREPARE INTERNAL DRAFT	RFI RPT		1	15APR96	9JUL96	60
220140305	1136 LANL RVW INTERNAL DRAFT	RFI RPT		1	10JUL96	6AUG96	20
220140310	1136 INC LANL COMMENT INT DRAFT	RFI RPT		1	7AUG96	4SEP96	20
220140315	1136 ISSUE DOE DRAFT	RFI RPT		1	5SEP96	18SEP96	10
22014M315	1136 DOE DRAFT OF RFI REPORT COMPLETE			1		18SEP96	0
220140320	1136 DOE REVIEW DOE DRAFT	RFI RPT		1	19SEP96	21OCT96	22
220140325	1136 INC DOE COMMENTS DOE DRAFT	RFI RPT		1	22OCT96	19NOV96	20
220140330	1136 ISSUE EPA DRAFT	RFI RPT		1	20NOV96	5DEC96	10
22014M330	1136 EPA DRAFT; COMPLETION OF RFI REPORT			1		5DEC96	0
220140335	1136 EPA REVIEW	RFI RPT		1	6DEC96	11FEB97	44
220140345	1136 INC EPA COMMENTS	RFI RPT		1	12FEB97	5MAR97	15
220140350	1136 ISSUE FINAL	RFI RPT		1	6MAR97	19MAR97	10



Plot Date 9MAY94
Data Date 1OCT93
Project Start 1OCT92
Project Finish 1JUN00

(c) Primavera Systems, Inc.

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

LOS ALAMOS NATIONAL LABORATORY
ADS 1136: TA-43
(BC-10) Baseline Working Schedule

Sheet 1 of 2

ENVIRONMENTAL RESTORATION			
Date	Revision	Checked	Approved

Figure ES-1. FY94 baseline schedule for OU 1136.

ACTIVITY ID	ACTIVITY DESCRIPTION		CAL ID	EARLY START	EARLY FINISH	ORIG DUR
1136: RFI REPORT						
22014M350	1136 REVISED RFI REPORT COMPLETE		1		19MAR97	0
1136: ADS MANAGEMENT REMEDIATION						
220210925	1136 SUPERVISE SOILS REMEDIATION	(LOE)	3	1JUL99	1JUN00	130
1136: VOLUNTARY CORRECTIVE ACTION REMEDIATION						
220280808	1136 CONDUCT VCA FY-98 SANITARY LINES	(LOE)	3	2MAR98	30SEP98	150
220280826	1136 VCA LLW SOILS REMEDIATION	(LOE)	3	1JUL99	1JUN00	130
22028M000	1136 START VCA SOILS REMEDIATION		1	1JUL99		0
22028M500	1136 VCA SOILS REMEDIATION COMPLETE		1		1JUN00	0
22028M750	1136 PROJECT COMPLETE		1		1JUN00	0

FY94 FY95 FY96 FY97 FY98 FY99 FY00 FY01 FY02 FY03

Plot Date 9MAY94
Data Date 10CT93
Project Start 10CT92
Project Finish 1JUN00

(c) Primavera Systems, Inc

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

1136

Sheet 2 of 2

LOS ALAMOS NATIONAL LABORATORY
ADS 1136: TA-43
(BC-10) Baseline Working Schedule

ENVIRONMENTAL RESTORATION

Date	Revision	Checked	Approved

1996. The schedule provides for a VCA should one be necessary and appropriate.

Cost estimates for OU 1136 activities based on the FY94 baseline are provided in Table ES-1. The estimated cost for implementing the RFI and reporting is $570 thousand. CMS costs have not currently been loaded but will be provided later in the RFI Report if the proposed investigation warrants CMS implementation.

TABLE ES-1

ESTIMATED COSTS OF BASELINE ACTIVITIES AT OU 1136

TASK	BUDGET ($K)	SCHEDULED START	SCHEDULED FINISH
RFI work plan	105	10/1/93	11/2/94
RFI	105	11/3/94	10/31/95
RFI report	75	11/1/95	3/19/97
Activity data sheet (ADS) management	46	10/1/93	9/30/97
Voluntary corrective action	239	3/2/98	6/1/00
Total	570		
Estimate to completion	570		
Escalation	50		
Prior years	146		
Total at completion	766		

The HSWA Module specifies the submittal of monthly reports and quarterly technical progress reports. In addition, RFI phase reports will be submitted at the completion of each of the sampling plans. The RFI phase reports will serve as

- a partial summary of the results of initial site characterization activities;
- vehicles for proposing modifications to the sampling plans suggested by the initial findings;
- work plans that describe the next phase of sampling, when such sampling is required;

- vehicles for recommending VCA or NFA as mechanisms for delisting PRSs shown by the RFI to have acceptable health-based risk levels; and,

- summary reports of the sampling plans.

At the conclusion of the RFI, a final RFI report will be submitted to the EPA.

Public Involvement

RCRA regulations and the HSWA Module of the Laboratory's hazardous waste operating permit mandate public involvement in the corrective action process. The Laboratory provides a variety of opportunities for public involvement, including meetings held to disseminate information, to discuss significant milestones, and to solicit informal public review of the draft work plans. The Laboratory also distributes meeting notices and updates the ER Program mailing list; prepares fact sheets summarizing completed and future activities; and provides public access to plans, reports, and other ER Program documents. These materials are available for public review between 9:00 a.m. and 4:00 p.m. on Laboratory business days at the Laboratory's public reading room at 1450 Central Avenue in Los Alamos and at the main branches of the public libraries in Española, Los Alamos, and Santa Fe.

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ACRONYMS AND ABBREVIATIONS

AEC	Atomic Energy Commission
AOC	Area of concern
AR	Administrative requirement
BRET	Biological Resource Evaluations Team
CEARP	Comprehensive Environmental Assessment and Response Progam
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CGI	Combustible gas indicator
CMS	Corrective measures study
COC	Contaminant of concern
CRZ	Contamination reduction zone
CST	Chemical Science and Technology (Division)
DA	Deferred action
DOE	US Department of Energy
DQO	Data quality objective
ENG	Facilities Engineering (Division)
EPA	US Environmental Protection Agency
ER	Environmental restoration
ESH	Environment, Safety, and Health (Division)
FID	Flame ionization detector
FTL	Field team leader
FY	Fiscal year
HRL	Health Research Laboratory
H	Health (Division)
HSPL	Health and safety project leader
HSWA	Hazardous and Solid Waste Amendments
IWP	Installation work plan
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory
LP	Laboratory procedure
LS	Life Sciences (Division)
MDA	Material disposal area
NFA	No further action
NMED	New Mexico Environment Department
NPDES	National pollutant discharge elimination system
OSHA	Occupational Safety and Health Administration
OU	Operable unit
OUPL	Operable unit project leader
OUHSP	Operable Unit Health and Safety Plan
PCOC	Potential contaminant of concern
PID	Photoionization detector
PPE	Personal protective equipment
PRS	Potential release site
QA	Quality assurance
QAPjP	Quality Assurance Project Plan
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
SAL	Screening action level

SCF	Sample Coordination Facility
SEN	Secretary of Energy notice
SSHSP	Site-specific health and safety plan
SOP	Standard operating procedure
SSO	Site safety officer
SWMU	Solid waste management unit
TA	Technical area
TSD	Treatment, storage, and disposal
TTL	Technical team leader
USFWS	US Fish and Wildlife Service
VCA	Voluntary corrective action
XRF	X-ray fluorescence

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Chapter 1

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- Installation Work Plan
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1.0 INTRODUCTION

1.1 Statutory and Regulatory Background

In 1976, Congress enacted the Resource Conservation and Recovery Act (RCRA), which governs the day-to-day operations of hazardous waste treatment, storage, and disposal (TSD) facilities. Sections 3004(u) and (v) of RCRA established a permitting system, which is implemented by the US Environmental Protection Agency (EPA) or by a state authorized to implement the program, and set standards for all hazardous-waste-management operations at a TSD facility. Under this law, Los Alamos National Laboratory (the Laboratory) qualifies as a treatment and storage facility and must have a permit to operate. The State of New Mexico, which is authorized by EPA to implement portions of the RCRA permitting program, issued the Laboratory's RCRA permit.

In 1984, Congress amended RCRA by passing the Hazardous and Solid Waste Amendments (HSWA), which modified the permitting requirements of RCRA by, among other things, requiring corrective action for releases of hazardous wastes or constituents from solid waste management units (SWMUs). EPA administers the HSWA requirements in New Mexico at this time. In accordance with this statute, the Laboratory's permit to operate includes a section, referred to as the HSWA Module, that prescribes a specific corrective action program for the Laboratory (EPA 1990, 0306). The HSWA Module includes provisions for mitigating releases from facilities currently in operation and for cleaning up inactive sites. The primary purpose of this RCRA field investigation (RFI) is to determine the nature and extent of releases of hazardous waste and hazardous constituents from potential release sites (PRSs). The plan meets the requirements of the HSWA Module and is consistent with the scope of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (DOE 1989, 0078).

The HSWA Module lists SWMUs, which are defined as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste." These wastes may be either hazardous or nonhazardous (for example, construction debris). Table A of the HSWA Module identifies 603 SWMUs at the Laboratory, and Table B lists 182 SWMUs that must be investigated first. In 1993 the Laboratory submitted a permit modification request that added 483 SWMUs, including one for this operable unit. In addition, the Laboratory has identified areas of concern (AOCs), which do not meet the HSWA Module's definition of a SWMU. These sites may contain radioactive materials and other hazardous substances listed under CERCLA. In this work plan, SWMUs and AOCs are hereafter collectively referred to as PRSs. The Environmental Restoration (ER) Program has a provision for recommending no further action (NFA) for AOCs as well as SWMUs. However, using this approach for AOCs does not imply that AOCs fall under the jurisdiction of the HSWA Module.

For the purposes of implementing the cleanup process, the Laboratory has aggregated PRSs that are geographically related in groupings called operable units (OUs). The Laboratory has established 24 OUs, and an RFI is to be performed for each. This Phase I RFI work plan for OU 1136 addresses PRSs located in one of the Laboratory's active technical areas (TAs): TA-43. This plan, together with other work plans submitted to EPA, meets the schedule requirement of the HSWA Module, which is to address a cumulative total of 55% of the SWMUs in Table A and a cumulative total of 100% of the priority SWMUs listed in Table B.

As more information is obtained, the Laboratory proposes modifications in the HSWA Module for EPA approval. When applications to modify the permit are pending, the ER Program submits work plans consistent with current permit conditions. Program documents, including RFI reports and the Installation Work Plan (IWP), are updated, and phase reports are prepared to reflect changing permit conditions.

The HSWA Module outlines five tasks to be addressed in an RFI work plan. Table 1-1 lists these tasks and indicates the ER Program equivalents.

1.2 Installation Work Plan

The HSWA Module requires that the Laboratory prepare a master plan, called the IWP, to describe the Laboratory-wide system for accomplishing all RFIs and corrective measures studies. The IWP has been prepared in accordance with the HSWA Module and is consistent with EPA's "Interim

TABLE 1-1

RCRA FACILITY INVESTIGATION GUIDANCE FROM THE HSWA MODULE

SCOPE OF THE RCRA FACILITY INVESTIGATION (RFI)	ER PROGRAM EQUIVALENT	
The RFI consists of 5 tasks:	*LANL Installation RFI Work Plan:*	*LANL Task/Site RFI:*
Task I: Description of Current Conditions A. Facility Background B. Nature and Extent of Contamination	**I. LANL Installation RI/FS Work Plan** A. Installation Background B. Tabular Summary of Contamination by Site	**I. OU 1136 Work Plan** A. Task/Site Background B. Nature and Extent of Contamination
Task II: RFI Work Plan A. Data Collection Quality Assurance Plan B. Data Management Plan C. Health and Safety Plan D. Community Relations Plan	**II. LANL Installation RI/FS Work Plan** A. General Standard Operating Procedures for A. Sampling Analysis and Quality Assurance B. Technical Data Management Program C. Health and Safety Program D. Community Relations Plan	**II. LANL Task/Site RI/FS Documents** A. Quality Assurance Project Plan and A. Field Sampling Plan B. Records Management Project Plan C. Health and Safety Project Plan D. Community Relations Project Plan
Task III: Facility Investigation A. Environmental Setting B. Source Characterization C. Contamination Characterization D. Potential Receptor Identification	**III. Task/Site Investigation** A. Environmental Setting B. Source Characterization C. Contamination Characterization D. Potential Receptor Identification	**III. Task/Site Investigation** A. Environmental Setting B. Source Characterization C. Contamination Characterization D. Potential Receptor Identification
Task IV: Investigative Analysis A. Data Analysis B. Protection Standards	**IV. LANL Task/Site Investigative Analysis** A. Data Analysis B. Protection Standards	**IV. LANL Task/Site Investigative Analysis** A. Data Analysis B. Protection Standards
Task V: Reports A. Preliminary and Work Plan B. Progress C. Draft and Final	**V. Reports** A. LANL Installation RI/FS Work Plan B. Annual Update of LANL Installation B. RI/FS Work Plan C. Draft and Final	**V. LANL Task/Site Reports** A. Quality Assurance Project Plan, Field Sampling A. Plan, Technical Data Management Plan, Health A. and Safety Plan, Community Relations Plan B. LANL Task/Site RI/FS Documents and LANL B. Monthly Management Status Report C. Draft and Final

Final RFI Guidance" (EPA 1989, 0088) and proposed Subpart S of 40 CFR 264 (EPA 1990, 0432), which proposes the cleanup program in Section 3004(u) of RCRA. The IWP was first prepared in 1990 and is updated annually. This work plan follows the requirements specified in Revision 3 of the IWP (LANL 1993, 1017).

The IWP describes the aggregation of the Laboratory's PRSs into 24 OUs (Subsection 3.4.1). It presents a facilities description in Chapter 2 and a description of the structure of the Laboratory's ER Program in Chapter 3. Chapter 4 describes the technical approach to corrective action at the Laboratory. Annexes I-V contain the Program Management Plan, Quality Program Plan (LANL 1991, 0840), Health and Safety Program Plan, Records Management Program Plan, and the Public Involvement Program Plan, respectively. The IWP also contains a proposal to integrate RCRA closure with corrective action and a strategy for identifying and implementing interim remedial measures. When information relevant to this work plan is provided in the IWP, the reader is referred to the appropriate section of the IWP.

1.3 Description of OU 1136

OU 1136, located in Los Alamos County in north-central New Mexico (Figures 1-1 and 1-2), consists of one operating technical area, TA-43. The OU covers approximately 160 acres lying in the northwestern section of the Los Alamos National Laboratory complex. The area lies at elevations between approximately 7,000 and 7,300 ft above sea level. Figure 1-3 shows the location of PRSs in the OU, which are located on property owned by the US Department of Energy (DOE).

This work plan addresses radioactive and other hazardous substances not regulated by RCRA but defined in CERCLA and other environmental laws. The goal of the Environmental Restoration Program at the Laboratory is to comply with RCRA, but also address CERCLA, the Atomic Energy Act, the National Environmental Policy Act, and other applicable regulations (LANL 1993,1017).

TA-43 was established in 1953 for the former Health (H) Division to conduct biomedical and industrial hygiene research. Since 1966, biomedical research

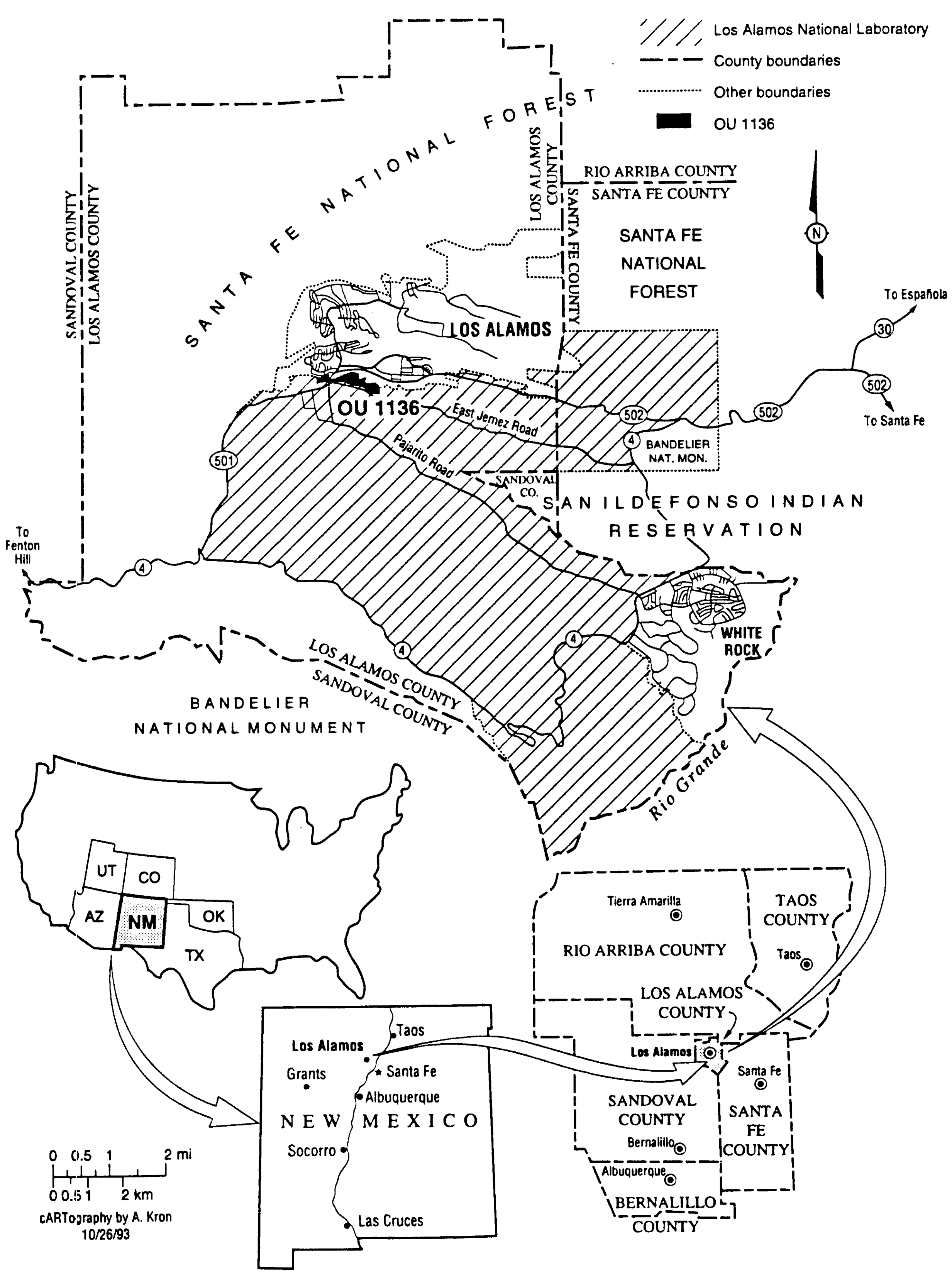


Figure 1-1. Location of Operable Unit 1136.

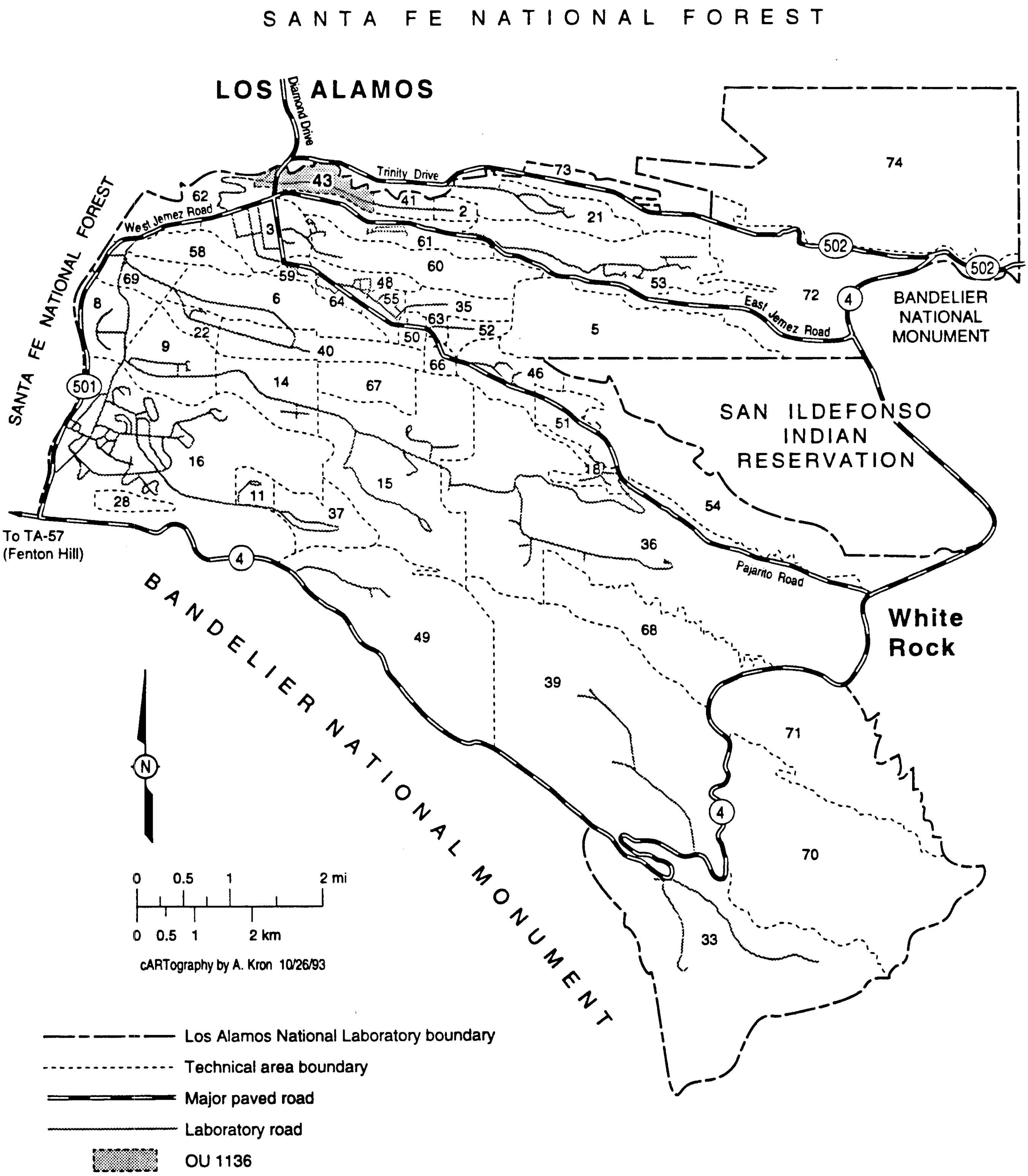


Figure 1-2. Location of Operable Unit 1136 with respect to Laboratory technical areas and surrounding landholdings.

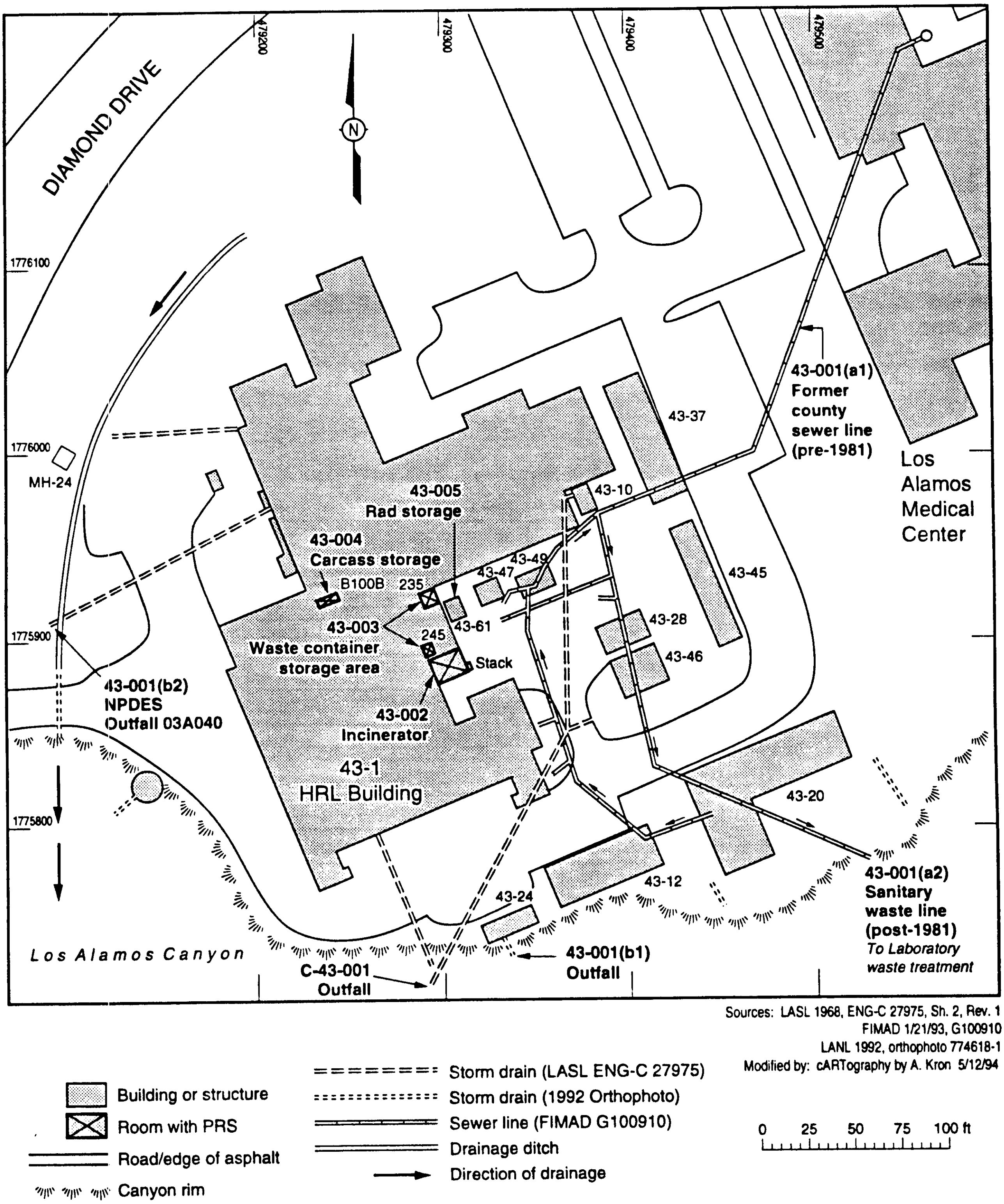


Figure 1-3. Locations of PRSs in TA-43.

has been conducted in TA-43 by the Life Sciences (LS) Division. A small satellite accumulation area was set up in 1990 to store hazardous chemicals and spent organic wastes.

OU 1136 PRSs are listed in Table 1-2, along with a brief description, the intended action for each, as well as the subsection of this work plan in which further information can be found. Only the sanitary sewer line, identified as 43-001, is listed as a SWMU in Table A of the HSWA Permit. In February 1993, the incinerator was added as a HSWA PRS. EPA's approval of this work plan demonstrates EPA's concurrence with the Laboratory that thePRSs recommended for NFA are viable candidates for removal from the ER Program via a permit modification.

TABLE 1-2

PRSs IN OU 1136

PRS	DESCRIPTION	ACTION	SUB-SECTION
43-001(a1)	Sanitary sewer line, pre-1981	Investigate	5.1
43-001(a2)	Sanitary sewer line, post-1981	DA*	6.1.1
43-001(b1)	Outfall	NFA	6.2.1
43-001(b2)	Outfall	Investigate	5.1
43-002	Incinerator	DA	6.1.2
43-003	Waste storage area	NFA	6.2.2
43-004	Carcass storage	NFA	6.2.3
43-005	Radioactive liquid storage	NFA	6.2.4
C-43-001**	Outfall	Investigate	5.1

*DA = deferred action.
**"C" designates Area of Concern.

1.4 Work Plan Organization

This work plan follows the generic outline provided in Table 3-1 of the IWP (LANL 1993, 1017). Following this introduction, Chapter 2 provides background information on OU 1136 which includes a description and history of the OU, a description of past waste management practices, and current conditions at technical areas in the OU.

Chapter 3 describes the environmental setting; Chapter 4 presents the technical approach to the field investigation; and Chapter 5 contains descriptions and evaluations of the OU 1136 PRSs that will be investigated further. Chapter 6 of this work plan provides a brief description of each PRS proposed for NFA or DA and the rationale for that recommendation.

Five annexes are included which address project plans corresponding to program plans in the IWP and the Generic Quality Assurance Project Plan: project management, quality assurance, health and safety, records management, and public involvement (LANL 1993, 1017) (LANL 1991, 0412). Appendix A contains the cultural resource summary; Appendix B contains the biological resource summary; Appendix C contains a list of contributors to this work plan; and Appendix D describes field investigation approach and methods.

The units of measurement used in this document are expressed in both English and metric units depending on which unit is commonly used in the field being discussed (Table 1-3). For example, English units are used in text pertaining to engineering, and metric units are often used in discussions of geology and hydrology. When information is derived from some other published report, the units are consistent with those used in that report.

A list of acronyms precedes Chapter 1. A glossary of unfamiliar terms is provided in the IWP (LANL 1993, 1017).

TABLE 1-3

APPROXIMATE CONVERSION FACTORS FOR SELECTED SI (METRIC) UNITS

MULTIPLY SI (METRIC) UNIT	BY	TO OBTAIN US CUSTOMARY UNIT
Cubic meters (m^3)	35	Cubic feet (ft^3)
Centimeters (cm)	0.39	Inches (in.) meters
Meters (m)	3.3	Feet (ft)
Kilometers (km)	0.62	Miles (mi)
Square kilometers (km^2)	0.39	Square miles (mi^2)
Hectares (ha)	2.5	Acres
Liters (L)	0.26	Gallons (gal.)
Grams (g)	0.035	Ounces (oz)
Kilograms (kg)	2.2	Pounds (lb)
Micrograms per gram (μg/g)	1	Parts per million (ppm)
Milligrams per liter (mg/L)	1	Parts per million (ppm)
Celsius (°C)	9/5 + 32	Fahrenheit (°F)

REFERENCES

DOE(US Department of Energy), October 6, 1989. "Comprehensive Environmental Response, Compensation, and Liability Act Requirements," DOE Order 5400.4, Washington, DC. (DOE 1989, 0078)

EPA (US Environmental Protection Agency), May 1989. "Interim Final RCRA Facility Investigation (RFI) Guidance, Volume I of IV, Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations," EPA/530-SW-89-031, OSWER Directive 9502.00-6D, Office of Solid Waste, Washington, DC. (EPA 1989, 0088)

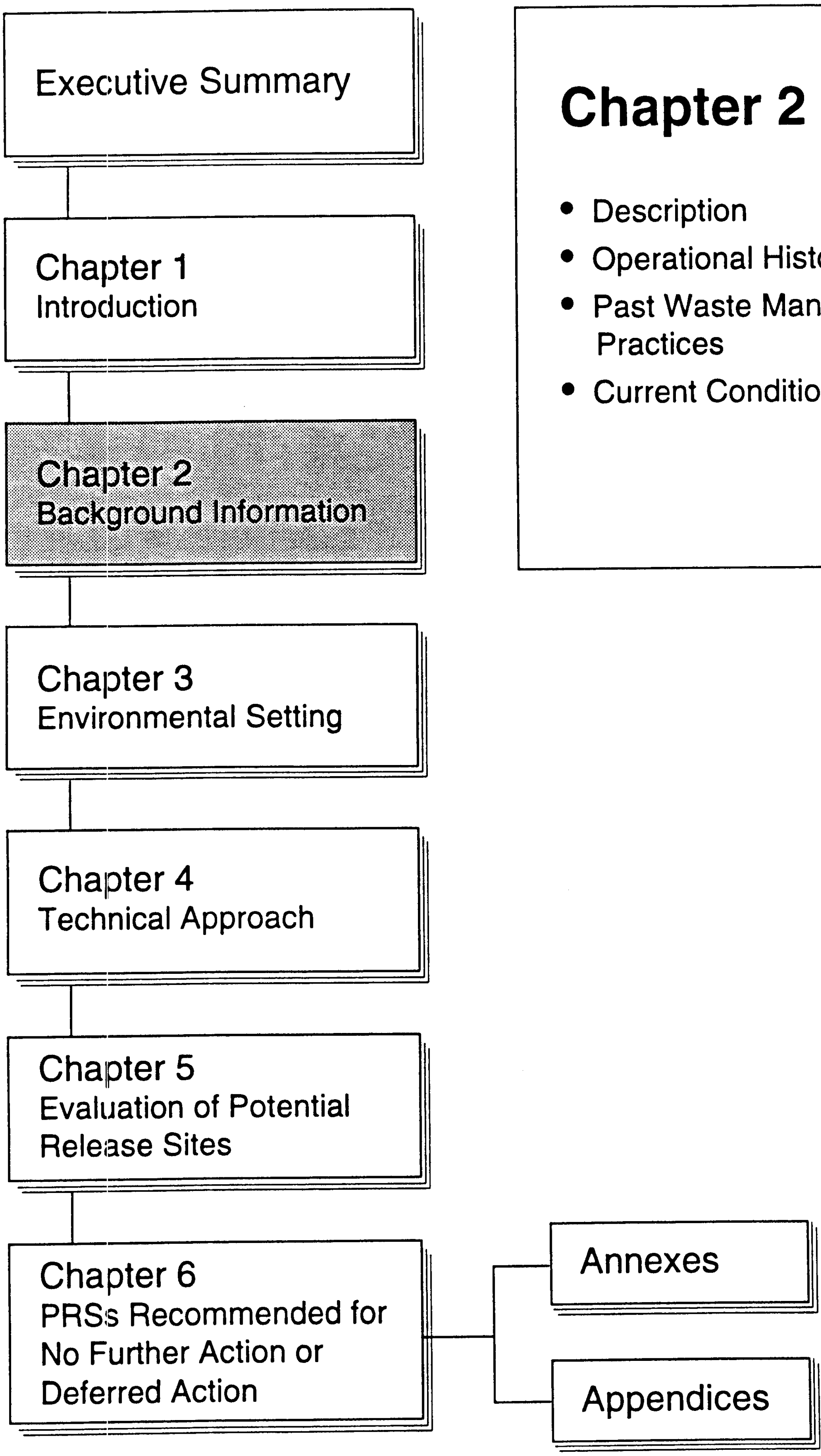
EPA (US Environmental Protection Agency), April 10, 1990. Model VIII of RCRA Permit No. NM0890010515, EPA Region 6, issued to Los Alamos National Laboratory, Los Alamos, New Mexico, effective May 23, 1990, EPA Region 6, Hazardous Waste Management Division, Dallas, Texas. (EPA 1990, 0306)

EPA (US Environmental Protection Agency), July 27, 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule, Title 40 Parts 264, 265, 270, and 271, Federal Register, Vol. 55, pp. 30798-30884. (EPA 1990, 0432)

LANL (Los Alamos National Laboratory), May 1991. "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Protection Program," Revision 0, Los Alamos National Laboratory report, Los Alamos, New Mexico. (LANL 1991, 0412)

LANL (Los Alamos National Laboratory), June 1991. "Los Alamos National Laboratory Quality Program Plan for Environmental Restoration Activities," Rev. 0, Los Alamos National Laboratory Report LA-UR-91-1844, Los Alamos, New Mexico. (LANL 1991, 0840)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)



Chapter 2

- Description
- Operational History
- Past Waste Management Practices
- Current Conditions at OU 1136

2.0 BACKGROUND INFORMATION

2.1 Description

Operable Unit (OU) 1136 is located in the northwestern section of the Laboratory complex. It encompasses a portion of Los Alamos Canyon extending from the south rim to points on the mesa north of the canyon. The western boundary is near the Los Alamos skating rink; the eastern boundary lies approximately 1.2 mi east of the rink. Omega Bridge (TA-0-40) and US Department of Energy's Los Alamos Area Office (TA-43-39) are included in the OU. Figure 2-1 shows the location of OU 1136.

Technical Area (TA) 43 is the only area of experimental activity and the location of potential release sites in OU 1136. It is located on the north rim of Los Alamos Canyon and is bounded on the north and west by Diamond Drive, on the east by the parking lot between the Health Research Laboratory (HRL) Building (TA-43-1), and the Los Alamos Medical Center. The area is paved except for a maintained lawn and natural vegetation along the canyon edge.

2.2 Operational History

TA-43 was established in 1953 with the opening of the Health Research Laboratory, TA-43-1, where the former Health (H) Division conducted biomedical and industrial hygiene research. The original emphasis focused on basic and applied research to assess health effects of radiation and materials associated with Laboratory operations. Trace amounts of a wide range of radionuclides, including uranium and plutonium, were used at the site. With the completion of the Occupational Health Building, TA-59-1, in 1966, industrial hygiene activities were moved out of TA-43. The site has since concentrated on biomedical research conducted by Life Sciences (LS) Division. Work includes diverse experiments at the molecular, cellular, and whole-body levels.

2.3 Past Waste Management Practices

Beginning in 1953, industrial waste lines carried liquid waste to the TA-45 wastewater treatment facility (SWMU 45-001), which served the original Laboratory complex on Los Alamos Mesa. With the closing of that facility in 1963, it was determined that wastewater contaminant levels from the HRL

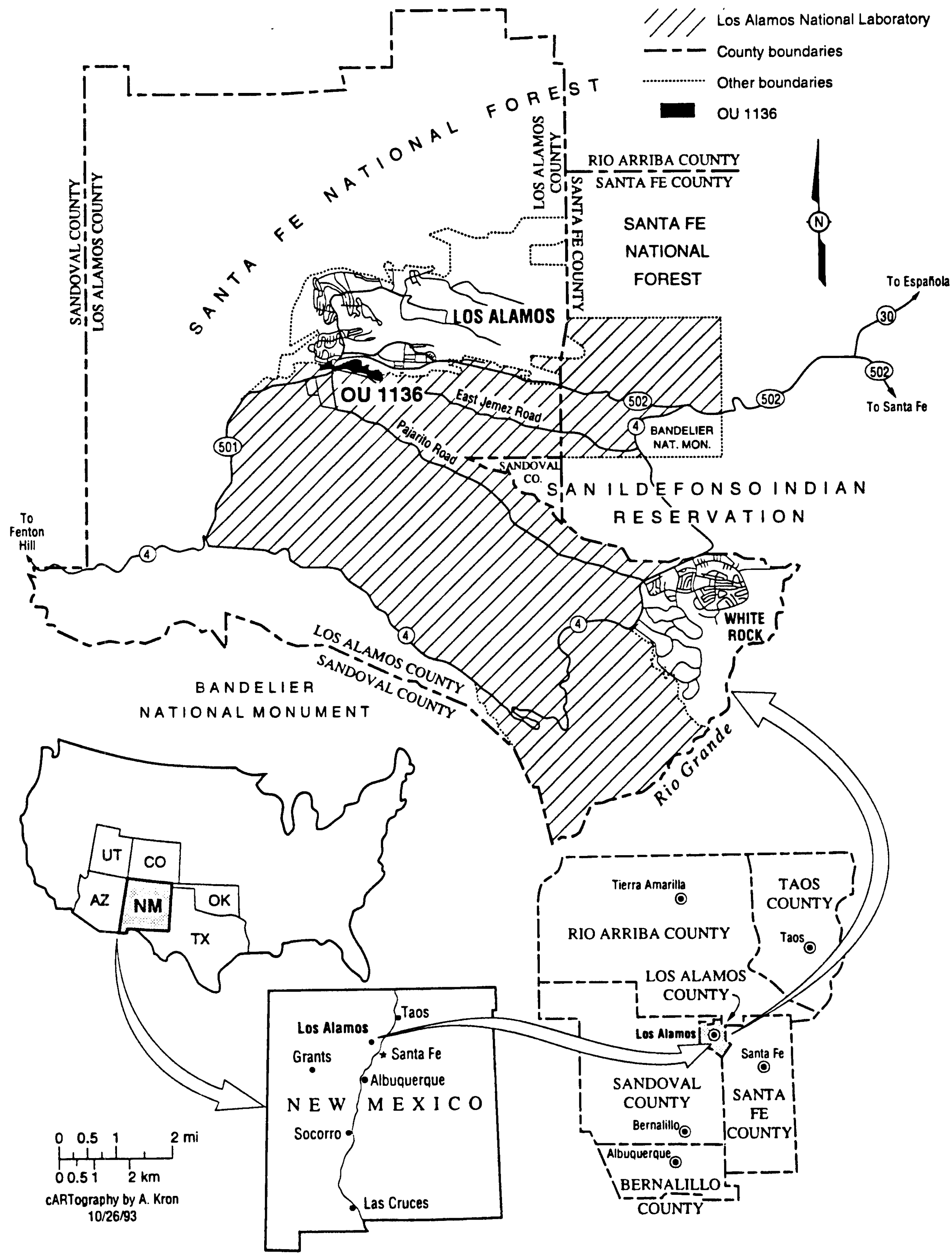


Figure 2-1. Location of Operable Unit 1136.

Building were sufficiently low, and the TA-43 system was diverted to the Los Alamos County sanitary sewer system's Bayo Plant (SWMU 0-018) rather than to the Laboratory's industrial waste treatment plant at TA-50. The remaining industrial waste lines have since been removed or are addressed within the work scope of OU 1071. In 1975, the practice of pouring low-level radioactive waste down the drain was discontinued, and containers for the transfer of contaminated liquid wastes to the treatment plant at TA-50 were placed in laboratories (LANL 1990, 0145).

Sanitary waste lines remained connected to the Bayo Plant until 1981, when they were connected to the TA-3 sanitary treatment plant, SWMU 3-014. Treated cooling water, once-through cooling water, and wastes from photoprocessing were routed into this sanitary system at various times. Cooling water effluent was subsequently routed to outfalls. After 1987, photoprocessing chemicals were processed through silver recovery units (LANL 1990, 0145).

The facility supported an active animal research facility, and trace amounts of a wide range of radionuclides have been utilized in many animal studies. Originally carcasses of mice and rats were burned in an incinerator in the basement of TA-43-1 (Watanabe 1993, 23-0047) until its removal in 1992 (Watanabe 1994, 23-0094). Carcasses of larger animals were stored in freezers in TA-43-1 before shipment to Material Disposal Area G at TA-54 (LANL 1990, 0145).

The Laboratory established a formal waste management program as required under 40 CFR 262 waste generator standards, resulting in a satellite accumulation area at TA-43-1 to store hazardous chemical and spent organic wastes in 1990. These units are regularly inspected and managed according to Resource Conservation and Recovery Act requirements; Laboratory waste management practices are described in Administrative Requirements AR-1 through AR-6 of the Laboratory's Environment, Safety, and Health Manual (LANL 1990, 0335).

2.4 Current Conditions at OU 1136

Biomedical research continues at TA-43, and the satellite accumulation area remains a regulated site. When the TA-3 wastewater treatment plant was decommissioned in 1992, the sanitary system was connected to the

Laboratory sanitary wastewater system consolidation facility at TA-46. LS Division is required to follow all Laboratory requirements for the disposal of hazardous waste; recycling programs have been established for many types of nonhazardous material.

REFERENCES

LANL (Los Alamos National Laboratory), June 1990. "Environment, Safety, and Health Manual," AR 10-3, Chemical, Hazardous and Mixed Waste, Los Alamos, New Mexico. (LANL 1990, 0335)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. (LANL 1990, 0145)

Watanabe, S., January 25, 1993. "Interview with Julie Wilson (LS-2) 1/25/93, Concerning SWMU 43-002 Incinerator," Los Alamos National Laboratory Memorandum CLS-ER SW93-002 to File from S. Watanabe (Ewing Technical Design), Los Alamos, New Mexico. (Watanabe 1993, 23-0047)

Watanabe, S., January 12,1994. "Removal of Incinerator," Los Alamos National Laboratory Memorandum CST-ER SW94-01 to File from S. Watanabe (Ewing Technical Design), Los Alamos, New Mexico. (Watanabe 1994, 23-0094)

Executive Summary

Chapter 1
Introduction

Chapter 2
Background Information

Chapter 3
Environmental Setting

Chapter 4
Technical Approach

Chapter 5
Evaluation of Potential Release Sites

Chapter 6
PRSs Recommended for No Further Action or Deferred Action

Annexes

Appendices

Chapter 3

- Physical Description
- Climate
- Cultural and Biological Resources
- Geology
- Hydrology
- Conceptual Three-Dimensional Geologic/Hydrologic Model of OU 1136

3.0 ENVIRONMENTAL SETTING

This chapter provides a description of the environmental setting at Operable Unit (OU) 1136 to ensure that potential release site (PRS)-specific sampling plans in Chapter 5 are based on all available relevant information concerning environmental conditions at OU 1136. The environmental setting of the Los Alamos National Laboratory (the Laboratory) as a whole is discussed in detail in Subsection 2.5 of the Installation Work Plan (IWP), Overview of the Environmental Setting (LANL 1993, 1017). This chapter makes specific reference to information contained in the IWP, where such information has relevance to this Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan.

Subsections 3.1 through 3.5 of this chapter provide a foundation for the conceptual geologic/hydrologic model in Subsection 3.6. This model pictorially summarizes environmental factors that are likely to influence contaminant migration in OU 1136. Knowledge of the geologic and hydrologic framework of OU 1136 is necessary to support the specific sampling plans in Chapter 5, to provide a framework for consideration for conceptual models (Chapters 4 and 5), and to justify the decisions for no further action outlined in Chapter 6. The data presented below suggest that environmental transport of any potential contaminants at OU 1136 would be extremely limited, although outfalls to Los Alamos Canyon could potentially have had some impact on groundwater in the alluvial aquifer.

Chapter 2 of the IWP (LANL 1993, 1017) provides regional data on surface water and groundwater quality, air quality, penetrating radiation levels, and chemical and radiation levels in soils to be used in the RFI work plan. These data address environmental conditions beyond the immediate range of effects of Technical Area (TA) 43 operations but may be needed to provide a basis against which site-specific data can be compared.

The data required to evaluate the behavior of hazardous contaminants in the environment at OU 1136 is addressed in Chapter 5, which also sets forth a sampling rationale and site-specific plans to identify the nature of environmental transport of hazardous contaminants in the technical area that composes OU 1136 (TA-43). These results can then be used to refine the conceptual exposure models in an iterative fashion and may be used to define the nature and scope of Phase II investigation, voluntary corrective actions, or corrective measures studies.

3.1 Physical Description

OU 1136 is located in the north-central portion of Los Alamos National Laboratory at elevations ranging from 7,300 ft at its highest point to 7,000 ft within Los Alamos Canyon (Figure 3-1).

OU 1136 is bounded on the west by TA-62, on the north and east by the town of Los Alamos, and on the south by TA-3. The surface of the mesa, which contains the majority of PRSs in this operable unit, is relatively flat.

Aerial photographs of TA-43 were taken in September 1991 at a scale of (1:7,200), and aerial orthophotographs (1:1,200) with 2-ft contour resolution have recently been prepared for the site. [Negatives are available through the Laboratory's Photography/Printing/Video Group (IS-9).]

3.2 Climate

Los Alamos County has a semiarid, temperate, mountain climate that is described in detail in Bowen (1990, 0033) and in Chapter 2 of the IWP (LANL 1993, 1017).

3.3 Cultural and Biological Resources

Summaries of cultural and biological resources are provided in Appendices A and B.

3.4 Geology

This subsection provides OU-specific information regarding the geology in OU 1136.

3.4.1 Bedrock Stratigraphy

The mesa surface of OU 1136 is underlain by the Bandelier Tuff of Pleistocene Age, which outcrops in a few places on the mesa tops and is exposed in canyon walls. Stratigraphic relations within OU 1136 are inferred from mesa-top and canyon-side mapping (Figure 3-2).

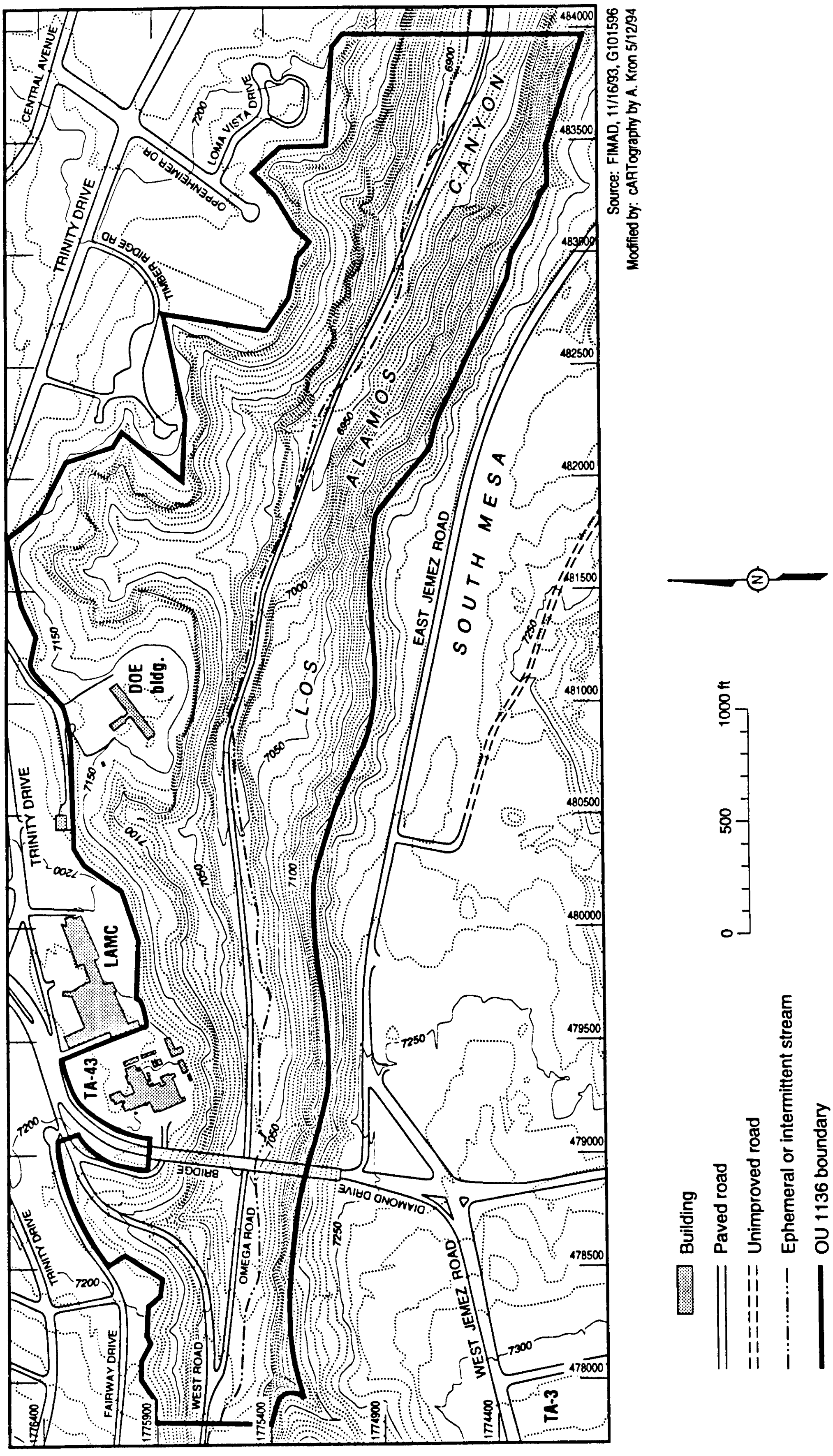


Figure 3-1. Topographic map of OU 1136.

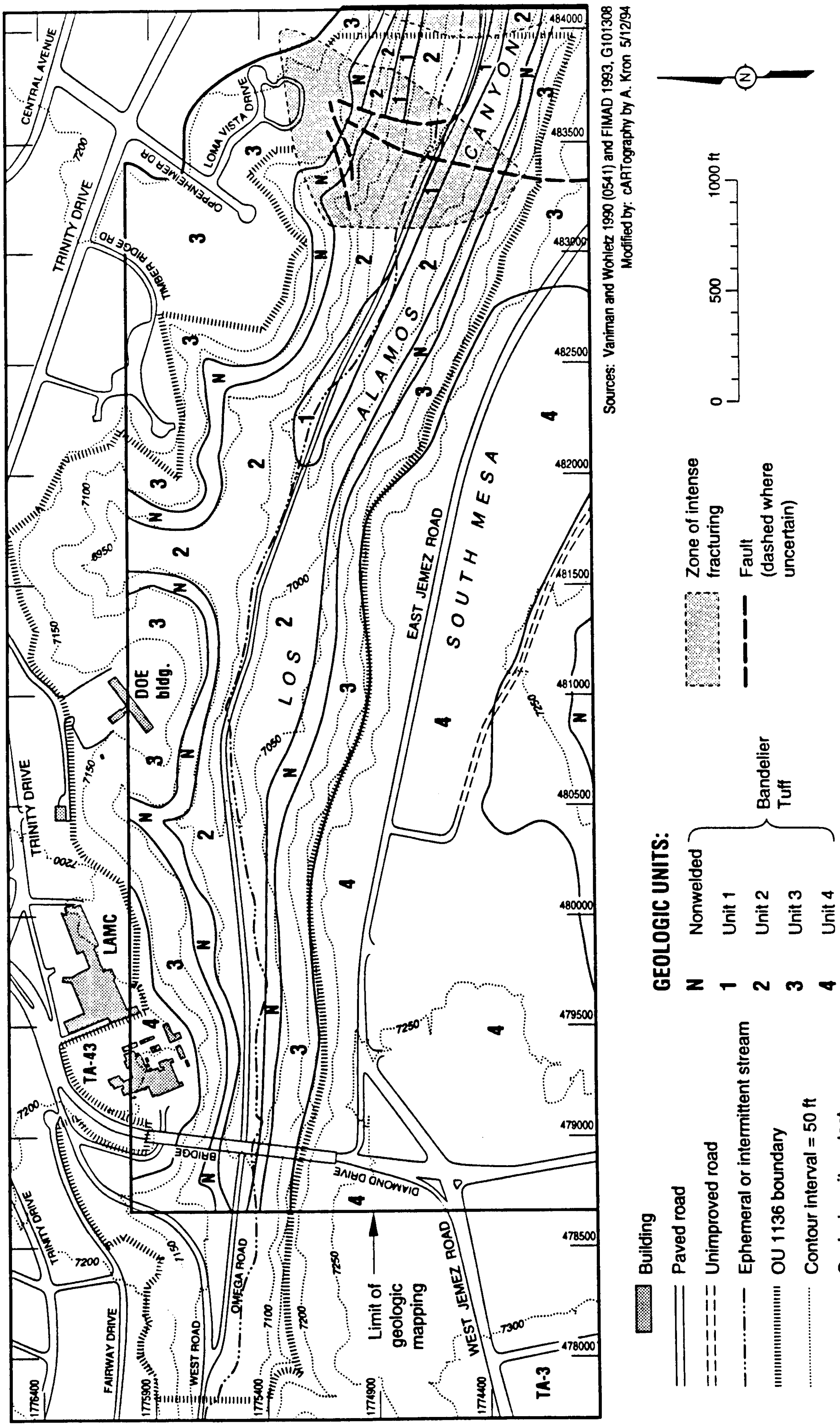


Figure 3-2. Geologic map of OU 1136.

Over fifty percent of OU 1136 was mapped by Vaniman and Wohletz (Vaniman and Wohletz 1991, 0541); the rest of the geology is inferred from their mapping. All of the surface exposure within OU 1136 is Tshirege Member of the Bandelier Tuff. The uppermost unit exposed is Unit 4, outcropping in the topographically highest areas of the OU, particularly on the south side of Los Alamos Canyon. Unit 3 is a poorly welded tuff of the cliff surfaces abutting Los Alamos Canyon. It composes the majority of the exposed surface underlying the operational area of OU 1136. Other stratigraphic units of the Tshirege member exposed in Los Alamos Canyon grade from a nonwelded tuff through a poorly welded, vapor-phase altered unit to a densely welded tuff (Figure 3-2).

3.4.2 Structure

Three large, near-vertical faults, the Frijoles segment of the Pajarito Fault zone, the Guaje Mountain Fault, and the Rendija Canyon Fault have been mapped within or near OU 1136. The first, located due west of the western boundary of the Laboratory, is the largest segment of the Pajarito Fault system in the Los Alamos area, with down-to-the-east displacement ranging up to 400 ft during the last 1.1 million years (Gardner and House 1987, 0110). The Rendija Canyon and Guaje Mountain Faults are normal faults showing surface evidence for down-to-the-east displacement north of OU 1136. They are inferred to pass through the operable unit. The Rendija Canyon Fault breaks the surface at the eastern end of OU 1136 (Figure 3-2), and the Guaje Mountain Fault runs just east of the OU boundary.

Broad zones of intense fracturing superimposed on primary cooling joints are associated with major faults in the Los Alamos region (Vaniman and Wohletz 1990, 0541). Unlike cooling joints, these tectonic fractures are likely to cross flow units and may provide a deeply penetrating flow path for groundwater migration.

3.4.3 Surficial Deposits

3.4.3.1 Alluvium and Colluvium

A general description of alluvial and colluvial deposits around the Laboratory is provided in the IWP, Subsection 2.6.1.6 (LANL 1993, 1017).

Surficial deposits on the plateau surface of OU 1136 consist of coarse-grained colluvium on steep hill slopes and along the bases of cliffs, finer-grained alluvial and colluvial sediments with a thin cover of eolian sediments on the flatter parts of mesa surfaces, and alluvial fans at the mouths of steeper drainages or colluvial deposits on escarpments related to post-Bandelier faulting. Deposits in the major canyons consist of colluvial materials that mask cliff bases, resulting from mass wasting, and fluvial sediments deposited by intermittent streams along the axes of canyon floors.

3.4.3.2 Soil

The nature and thickness of soils at TA-43 may influence the transport of hazardous contaminants in the local environment. Soil mineralogy, permeability, grain size, organic content, and chemistry are all factors that may impede or enhance the movement and concentration of individual hazardous constituents within the operable unit.

Soils in Los Alamos County were mapped and described by Nyhan et al. (1978, 0161). The soils developed in a semiarid climate on parent material derived from Bandelier Tuff bedrock. Figure 3-3 shows the spatial distribution of soils around TA-43 (Nyhan et al. 1978, 0161).

Although a limited variety of soil types are present (Table 3-1), the majority of OU 1136 is underlain by tuff bedrock. The soil units grade into outcrops of Bandelier Tuff along the margins of the mesa tops, and soils are generally thicker in the western portions of OU 1136.

TABLE 3-1

OU 1136 SOILS

ABBREVIATION	NAME	LOCATION	PERMEABILITY	WATER HOLDING	TYPICAL THICKNESS
TO	Tocal very fine sandy loam	Los Alamos Canyon	Low/moderate	Low	28-36 cm
PG	Pogna fine sandy loam	DOE Los Alamos Area Office	Moderate/high	Low	13-30 cm
TR	Typic Ustorthents	Canyon edge	Moderate	Low	13-35 cm

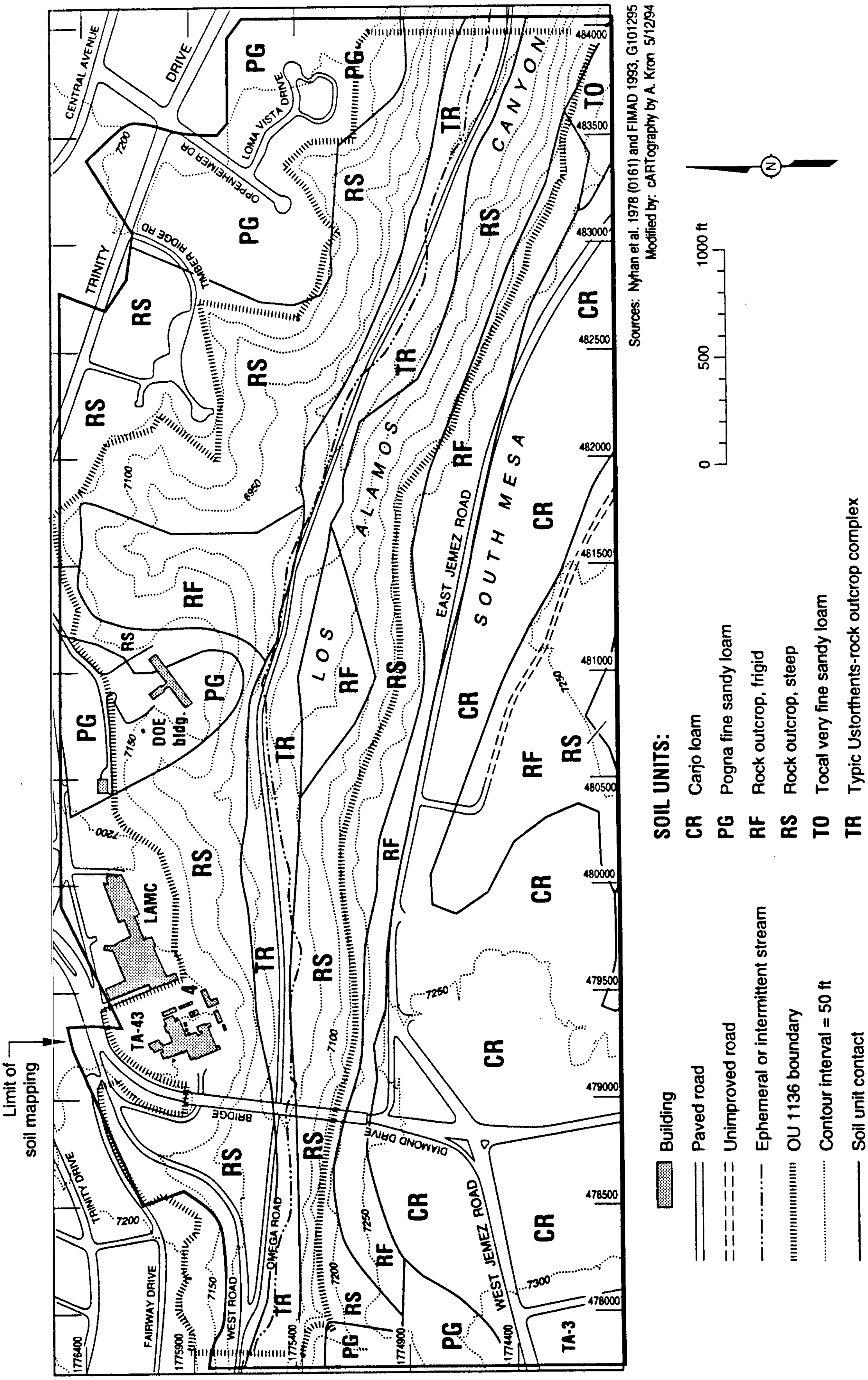


Figure 3-3. Soil map of OU 1136.

Chapter 2 of the IWP (LANL 1993, 1017) states that an impermeable clay zone often forms at the soil-tuff interface on the Pajarito Plateau. This layer may provide an effective barrier to the movement of groundwater from the soil into the underlying tuff (Weir and Purtymun 1962, 0228; Abeele et al. 1981, 0009). In disturbed areas, however, where soils have been scraped off and bedrock exposed, surface waters may infiltrate into the tuff.

3.4.3.3 Erosional Processes

Erosion on the mesa tops in OU 1136 results from shallow overland flow on the relatively flat mesa surfaces by rill or gully erosion in channels cut into the mesa surfaces and by rockfalls and colluvial transport from the steep canyon walls. Erosion in the canyon bottom occurs primarily by channelized flow along stream course on the canyon floor.

Erosion of colluvial materials may occur as small masses of material that tumble down canyon walls; small debris flows that issue from the mouths of subsidiary channels to the main canyon drainages; or slides of large, relatively coherent landslide blocks from the steeper mesa edges.

Contaminants trapped in sediments on mesa tops may be transported into Los Alamos Canyon and potentially off site by large-scale runoff events on the mesa surfaces, or may be carried in large masses of rock and debris as they slide down valley walls into the canyon. Contaminated sediments in the canyon are most likely to be transported off site in major runoff events. Waste sites in OU 1136 most likely to be susceptible to off-site mobilization are those that lie close to the edges of mesas or near active channels on the canyon floor.

3.5 Hydrology

Groundwater is considered unlikely to be an active transport agent at TA-43 because of the great depth to the main aquifer (>1,000 ft). However, surface and vadose zone hydrology may strongly influence the stability and movement of contaminants in the area.

3.5.1 Surface Water Hydrology

Surface water runoff and infiltration into soil are important hydrologic agents at OU 1136 that may influence contaminant transport, including the location of the drainage system and associated sediment deposition; rates of soil erosion, transport, and sedimentation; the effects of operational disturbances on surface hydrology; the influence of infiltration as a transport pathway in different soil types; the solubility of contaminants in surface aquifers; the nature of interactions between soils and water-borne contaminants; and the ultimate disposition of surface water at TA-43.

3.5.1.1 Surface Water Runoff

Surface water runoff is an effective transport agent for many contaminants, particularly highly soluble contaminants, in an ecosystem media. Runoff can mobilize contaminants and transport them off site or concentrate dispersed surficial contaminants through solution and reprecipitation or sorption processes. Surface water runoff from OU 1136 flows from ephemeral streams on the mesa tops into Los Alamos Canyon and ultimately into the Rio Grande, or it infiltrates downgradient.

Los Alamos Canyon within OU 1136 is characterized as an ephemeral or intermittent stream fed by several perennial springs in its upper reaches. There is minimal evidence for the hydraulic connection of surface water and the regional aquifer at TA-43, or elsewhere at the Laboratory (IWP, Chapter 2) (LANL 1993, 1017), although it is possible there is a connection between discharge sinks in canyon bottoms and the main aquifer east of OU 1136. The permanent alluvial aquifer in Los Alamos Canyon may have received some discharge from outfalls at OU 1136.

As described in the IWP, the heaviest precipitation on the Pajarito Plateau occurs during summer thunderstorms. These thunderstorms can produce transient high discharge rates that may transport dissolved material, colloids, and contaminated sediments. Both these rain-induced events and snowmelt may yield ephemeral stream flows in the major canyons that could reach the Rio Grande.

No comprehensive study of surface runoff from the mesa tops and canyons constituting the surface watershed of the Pajarito Plateau has been completed.

Water quality data have been collected downstream from TA-43 in Los Alamos Canyon for the past 30 years. These data show radionuclide contamination, primarily from reactor operations at TA-2, but other sources such as TA-21 or TA-53 may be involved.

3.5.1.2 Surface Water Infiltration

Surface water infiltration is a potential mechanism for surface contaminants to move into subsurface soils and tuffs and eventually reach perched or regional aquifers. Surface water infiltration is considered to be a minor transport mechanism at the Laboratory because of the great depth to the regional aquifer, the high evaporative potential of the upper tuff, the influence of vegetative transpiration, and the resulting naturally low moisture content and high porosity of the tuffs (LANL 1993, 1017). However, discharge from outfalls to alluvial groundwater in Los Alamos Canyon may have provided a contaminant pathway in the past. The extent of any influence should appear in sample data from OU 1049 and OU 1098.

3.5.2 Hydrogeology

The hydrogeology of the Laboratory and the occurrence of surface water and groundwater are summarized in Subsection 2.6.2 of the IWP (LANL 1993, 1017). Canyon and mesa topography and the ash deposits of the Bandelier Tuff control the hydrogeology of OU 1136. The hydrology (occurrence and movement of water in surface and subsurface environments) of individual PRSs in OU 1136 is controlled by their physiographic location in canyon bottoms, canyon rims, or mesa tops. The majority of OU 1136 PRSs lie on the mesa tops or in buildings, although a few are located on the rims of the canyons. The following discussion presents site-specific information on the hydrologic conditions in Los Alamos Canyon and on the mesa top of OU 1136.

3.5.2.1 Vadose Zone

The mesa top of OU 1136 overlies at least 700 ft of unsaturated Bandelier Tuff, interbedded epiclastic sediments and pumice falls, and underlying Puye Formation sediments. The hydrology of the mesa top vadose zone is discussed in Subsection 2.6.2 of the IWP (LANL 1993, 1017). In general, the IWP suggests that the Bandelier Tuff is not saturated, except in very shallow and localized areas. The low moisture content and extensive thickness of unsaturated rock is thought to impede movement of fluids downward to the main aquifer (LANL 1993, 1017).

Hydrologic characteristics of unfractured Bandelier Tuff depend on degree of welding, with porosity and hydraulic conductivity generally decreasing with increased degree of welding. At Los Alamos, saturated hydraulic conductivity for a moderately welded tuff ranges from 0.1 to 1.7 ft/day and for a welded tuff ranges from 0.009-0.26 ft/day (Abeele et al. 1981, 0009). However, because fracture density is generally greatest in welded tuffs, saturated hydraulic conductivities are often highest in the welded parts of ash flow deposits (Crowe et al. 1978, 0041). Hydraulic conductivity data for Bandelier Tuff are listed in Table 2-2 of the IWP (LANL 1993, 1017).

3.5.2.2 Alluvial Aquifer

Surface water in saturated alluvium within canyons is discussed in Subsection 2.6.2 of the IWP (LANL 1993, 1017). Perennial water flow occurs in the upper reaches of Los Alamos Canyon supplying a permanent alluvial aquifer. Stream flow moves downgradient into the alluvium for an unknown distance. Stream loss caused by infiltration into the underlying alluvium typically prevents surface water flow from discharging across the eastern boundary of the OU, but this varies with seasonally dependent flow rates. During periods of voluminous stream runoff or snowmelt, surface flow may reach the Rio Grande.

3.5.2.3 Perched Aquifers

Perched water may occur in epiclastic sediments and basalts in the Pajarito Plateau (IWP, Subsection 2.6.2) (LANL 1993, 1017). The possible nature and location of perched aquifers in and around OU 1136 is not known, although recent drilling activities at OU 1106 indicate that there may be a connection between surface water and a perched zone above the main aquifer in Los Alamos Canyon.

3.5.2.4 Main Aquifer

The depth to the main aquifer at OU 1136 has not been determined. The hydrology of the main aquifer beneath the Pajarito Plateau is described in

Subsection 2.6.2 of the IWP (LANL 1993, 1017). According to the IWP, the main aquifer is located primarily in the Santa Fe Group and Puye Formation at depths of several hundred to greater than 1,000 ft below the mesa tops. Based on current knowledge of the hydrology of the Pajarito Plateau as reflected in the IWP, the potential for impact on the main aquifer or the municipal drinking water supply from the PRSs in OU 1136 is thought to be extremely low.

3.6 Conceptual Three-Dimensional Geologic/Hydrologic Model of OU 1136

A conceptual model for OU 1136 based on the discussion of environmental setting presented in Subsections 3.1 through 3.5 of this chapter is presented in simplified diagrammatic form in Figure 3-4. The physical processes and major pathways included in the model are based on current knowledge of the OU environment and the types of PRSs present at OU 1136. The general processes and pathways discussed below provide the basis for the site-specific conceptual models for potential contaminant releases presented in Chapters 4, 5, and 6. The primary release mechanisms and migration pathways of concern are

- surface runoff and sediment transport,
- erosion and surface exposure,
- infiltration and transport in the vadose and saturated zones, and
- atmospheric dispersal of particulates.

These pathways are thought to provide the greatest potential for release and transport of contaminants to the environment at OU 1136. Additional release migration pathways of some concern are fluid transport via alluvial aquifers, perched water, springs, and seeps.

3.6.1 Surface Water Runoff and Sediment Transport

Surface water runoff and sediment transport are the migration pathways with greatest potential for transport of contaminants to off-site receptors.

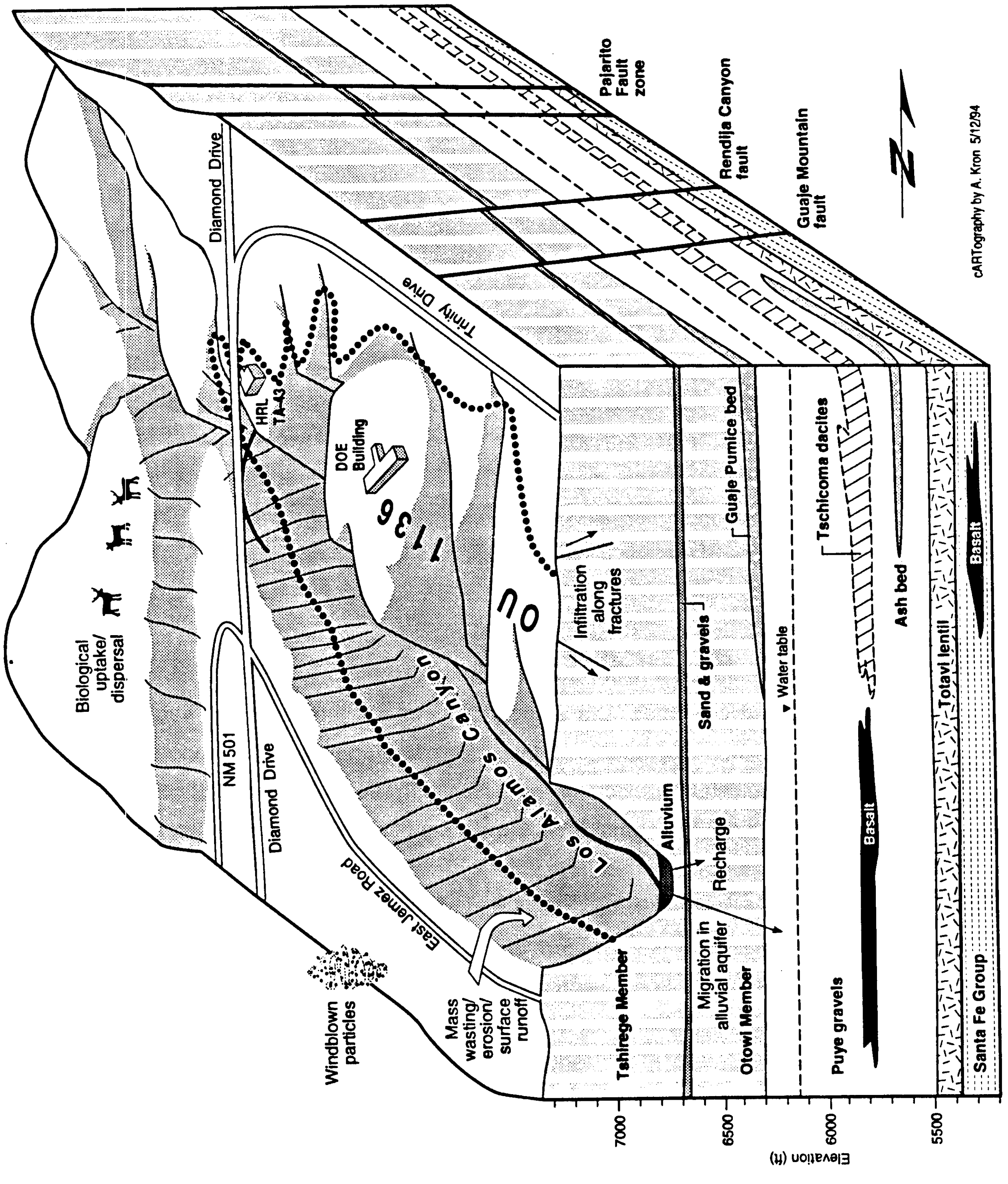


Figure 3-4. Conceptual geohydrologic model of OU 1136.

Surface water runoff is concentrated by natural topographic features and man-made diversions, and flows toward the canyons. Topographic lows can cause runoff to pond and infiltrate into the mesa top, or facilitate sorption of contaminants onto finer-grained clay-rich sediments or organic particles. Contaminant transport by surface water runoff can occur in solution, by adsorption on suspended colloids, or with movement of heavier bedload sediments. Surface soil erosion and sediment transport are related to soil properties and are a function of runoff intensity. Contaminants transported in runoff can disperse or concentrate in sediment traps in drainages, and erosion of drainage channels can disperse contaminants downgradient.

3.6.2 Erosion and Surface Exposure

Soil erosion and mass wasting are release mechanisms that may expose subsurface contaminants or allow water to access previously contained wastes. Erosion of surface soils depends on soil properties, vegetative cover, slope, exposure, intensity and frequency of precipitation, and seismic activity. Mass movement of rock from canyon walls is a sporadic, discontinuous process that can be an important mechanism for exposing subsurface contaminants located near canyon rims.

3.6.3 Infiltration and Transport in the Vadose and Saturated Zones

Infiltration into surface soils and tuffs depends on the rates of precipitation and snowmelt, the amount of ponding, the nature of vegetation, *in situ* moisture content, and the hydraulic properties of soil and tuff. Joints and faults may provide pathways for infiltration and release of contaminants into the shallow subsurface. Movement of liquids in soil and tuff is dominated by transient, unsaturated flow processes influenced by infiltration and evapotranspiration. The movement of contaminants by liquids in the unsaturated zone can occur in a free-liquid phase, in solution, or by adsorbed particles on colloids. Contaminants may be retarded as a result of adsorption on tuff or on organic material present in soil or alluvium. Precipitation of insoluble, contaminant-rich minerals such as barite may also retard the mobility of specific contaminants. Lateral flow or perched water may occur at unit contacts, between layers whose hydraulic properties differ, and in alluvial aquifers. Saturated lateral flow may discharge as springs or seeps on canyon walls or in canyon bottoms. In addition, outfall discharge can infiltrate alluvial groundwater pathways and migrate downgradient as recharge to the Otowi Member/Bandelier Tuff.

Vapor phase movement in the unsaturated zone is a potentially important transport mechanism for volatile contaminants. Movement of contaminants in the vapor phase is influenced by concentration gradients, temperature gradients, density gradients, and/or air pressure gradients. Fractures may enhance liquid-phase or vapor-phase contaminant transport in the subsurface.

3.6.4 Atmospheric Dispersion

Wind entrainment of contaminated particulates, detonation or burn products, material releases from point sources such as stacks, or volatile organic compounds is a potential pathway for atmospheric dispersal of contaminants. This dispersal mechanism is limited to high explosive detonation and combustion byproducts, surface contaminants, and vapors released from soil pore gases, as well as point sources. Entrainment and deposition of particulates is controlled by soil properties, surface roughness, vegetative cover, terrain, and atmospheric conditions including wind speed, wind direction, and precipitation. Vapor dispersion is controlled by similar factors.

Not all release mechanisms and migration pathways discussed in this subsection are thought to be relevant for all PRSs in OU 1136. However, the generic conceptual models in Chapter 4 indicate for which sites these contaminant dispersal processes may operate.

REFERENCES

Abeele, W. V., M. L. Wheeler, and B. W. Burton, October 1981. "Geohydrology of Bandelier Tuff," Los Alamos National Laboratory Report LA-8962-MS, Los Alamos, New Mexico. (Abeele et al. 1981, 0009)

Bowen, B. M., May 1990. "Los Alamos Climatology," Los Alamos National Laboratory Report LA-11735-MS, Los Alamos, New Mexico. (Bowen 1990, 0033)

Crowe, B. M., G. W. Linn, G. Heiken, and M. L. Bevier, April 1978. "Stratigraphy of the Bandelier Tuff in the Pajarito Plateau, Applications to Waste Management," Los Alamos Scientific Laboratory Report LA-7225-MS, Los Alamos, New Mexico. (Crowe et al. 1978, 0041)

Gardner, J. N., and L. House, October 1987. "Seismic Hazards Investigations at Los Alamos National Laboratory, 1984 to 1985," Los Alamos National Laboratory Report No. LA-11072-MS, Los Alamos, New Mexico. (Gardner and House 1987, 0110)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

Nyhan, J. W., L. W. Hacker, T. E. Calhoun, and D. L. Young, June 1978. "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific Laboratory Report LA-6779-MS, Los Alamos, New Mexico. (Nyhan et al. 1978, 0161)

Vaniman, D., and K. Wohletz, November 14, 1990. "Results of Geological Mapping/Fracture Studies: TA-55 Area," Los Alamos National Laboratory Memorandum EES1-SH90-17, Los Alamos, New Mexico. (Vaniman and Wohletz 1990, 0541)

Weir, J. E., Jr., and W. D. Purtymun 1962. "Geology and Hydrology of Technical Area 49, Frijoles Mesa, Los Alamos County, New Mexico," US Geological Survey Administrative Release, Albuquerque, New Mexico. (Weir and Purtymun 1962, 0228)

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4.0 TECHNICAL APPROACH

This section presents the technical approach for the evaluation of potential release sites (PRSs) at Operable Unit (OU) 1136 during this phase of the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI). The technical approach described herein is applied to all PRSs included in Chapter 5.

4.1 Potential Release Sites

Chapter 5, Evaluation of Potential Release Sites, presents the conceptual models, data needs, data quality objectives, and sampling and analysis plans for all PRSs that will undergo a current RFI. In Chapter 5, three PRSs are discussed in terms of characterization sufficient to support a screening assessment decision. Table 1-2 in Chapter 1 lists the PRSs and the actions recommended for each.

4.2 Approach to Site Characterization

This work plan adheres to the Environmental Restoration (ER) Program's technical approach for data collection and evaluation as documented in Chapter 4 of the Los Alamos National Laboratory's (the Laboratory's) Installation Work Plan (IWP) (LANL 1993, 1017). This methodology adopts the philosophy of the observational approach (Appendix G, IWP) (LANL 1993, 1017) and incorporates the data quality objectives process [Chapter 4 and Appendix H of the IWP (LANL 1993, 1017)], which bases decisions for action on definitions for acceptable uncertainties that depend on the current phase of the investigation. Investigations are phased so that decisions remain closely tied to the ultimate goal of selecting an appropriate corrective action and so that they are formulated in light of what is already known about the site. The ER Program has adopted a risk-based approach to making corrective action decisions during the RFI/corrective measures study (CMS) process. This Phase I work plan presents sampling plans that are designed to obtain data suffiicient to support screening assessment decisions as the first step toward completing the RFI/CMS process for OU 1136.

Screening action levels (SALs) that define the threshold concentrations for decision-making are formulated according to conservative human health risk-based criteria. Ecological risk assessment methodologies and National

Resource Damage Assessment are currently under development. Guidance on the measurement end points and spatial scales for determining significant ecological effects is available in Appendix L of the IWP (LANL 1993, 1017). No further action (NFA) for individual PRS samples in this Phase I investigation will be proposed based on a comparison to SALs, but a comparison to ecological risk-related factors may be conducted at the appropriate spatial scale to identify ecological effects. If unacceptable ecological effects are identified, then NFA decisions will be revisited, and contribution of all PRSs to the unacceptable ecological risk will be assessed so that an effective mitigation strategy can be developed.

Certain environmental criteria, as required by the National Environmental Policy Act, Endangered Species Act, wetlands executive orders, or historic preservation act will be evaluated before sampling or any other significant site activity. The purpose of these evaluations is to determine the impact of sample collection on components of the environment protected by these specific regulations. These regulatory drivers may be important in future ecological risk assessments and include

- state or federal sensitive, threatened, or endangered plant or animal species that potentially occur in OU 1136;
- sensitive areas (e.g., flood plains or wetlands); and
- plants and wildlife of cultural importance.

4.2.1 Decision Model

The decision process for an RFI is presented in Section 4.2.1 and Figure 4.1 of the IWP (LANL 1993, 1017). The first step in the RFI is to evaluate archival information and make field reconnaissance visits to formulate a conceptual exposure model for the site. These data help develop a list of potential contaminants of concern (PCOCs), identify potentially exposed populations, and characterize possible exposure pathways.

NFA or deferred action (DA) may be recommended after the first step of the RFI. Brief discussions of NFA and DA based on archival information are provided in Subsections 4.2.4 and 4.4.1 of this work plan. The criteria for proposing NFA or DA, along with the PRSs recommended for NFA or DA based on archival information, are presented in Chapter 6.

A further goal of this phase of the OU 1136 RFI, for those PRSs that are not proposed for NFA or DA, is to detect the presence of contaminants of concern (COCs). COCs are defined as hazardous constituents or radionuclides whose levels are above SALs or, when ncessary, above background levels (Appendix J of the IWP) (LANL 1993, 1017). SALs are media-specific concentration levels for potential contaminants derived using conservative criteria. SALs are discussed in Subsection 4.2.2.

For three PRSs in OU 1136, the archival information indicates that it is highly probable there are no COCs at the site, but there are no existing data and the archival information is not sufficient to recommend NFA. A list of PCOCs is provided in Table D-1 in Appendix D. For these sites, a screening assessment will be conducted to determine the presence or absence of COCs. A primary goal of screening assessments is to identify those PRSs that do not pose an unacceptable hazard to human health or the environment so that they can be recommended for NFA. Eliminating non-problems through screening assessments allocates resources efficiently and effectively and provides timely corrective actions for those PRSs that present the greatest hazard. The generic logic flow for screening assessments is shown in Figure 4-3 in the IWP (LANL 1993, 1017). Descriptions of the sampling strategies used to support screening assessment decisions for PRSs in OU 1136 are given in Subsection 4.5.

If COCs are detected in the screening assessment phase, then a decision will be made to either perform a baseline risk assessment or to implement a voluntary corrective action (VCA). Additional characterization data will be required to support a baseline risk assessment and will be collected as part of a Phase II study if necessary. Presently there is one PRS identified for which it is anticipated that a VCA may be required depending on the results of the Phase I screening assessment or subsequent baseline risk assessment. If the requirement to perform a VCA is realized, then the up-to-date US Environmental Protection Agency/US Department of Energy/ Laboratory guidance on VCAs will be followed.

4.2.2 Screening Action Levels

SALs are media-specific concentration levels for potential contaminants derived using conservative criteria (IWP Appendix J) (LANL 1993, 1017). In most cases, SALs for nonradioactive potential contaminants are based on the methodology in Proposed Subpart S of 40 CFR 264 to calculate action levels (EPA 1990, 0432). Radiological SALs are based on a 10-mrem-per-year dose using a residential-use exposure scenario. However, if a regulatory standard exists (e.g., a maximum contaminant level), then this value is used in place of the SAL. The derivation of SALs is discussed in Chapter 4 of the IWP and the values are given in Appendix J (LANL 1993, 1017). The motivation for developing SALs is to have a tool for effective discrimination between problem and non-problem sites so that resources are used effectively. SALs are not cleanup levels; cleanup levels will be based on site-specific risk evaluations. In most cases, cleanup levels will be higher than SALs. For example, if the site will never be used for residential use, the site-specific land use scenario (e.g., continued Laboratory use) could allow higher levels of soil contamination than the conservative residential use scenario used to calculate SALs.

SALs for the primary PCOCs at OU 1136 are given in Table D-1 in Appendix D. These PCOCs were identified through the evaluation of archival information and historical data.

If other PCOCs are detected, additional SALs will be provided.

4.2.3 Active Sites

Some PRSs or portions of PRSs in OU 1136 that are scheduled for field investigation are integral components of active site operations. Subsurface PRSs at most active sites present no current health hazard; however, they may be investigated where characterization of such PRSs will not seriously disrupt active operations. In some cases, final investigations and permanent corrective actions for active PRSs or PRSs beneath active sites will be addressed when the site is decommissioned. However, it is appropriate to ascertain if off-site migration of contaminants from these PRSs is occurring or is likely to occur. If off-site migration of potential contaminants is occurring, as determined through a screening assessment decision, then either a Phase II survey will be conducted to support a baseline risk assessment or a VCA will be implemented.

4.3 Conceptual Exposure Models for OU 1136

Conceptual exposure models were developed to identify potential contaminant migration pathways and any potential human receptors. This information helps to specify the location and magnitude of sampling and analytical methods needed to accurately characterize PRSs at OU 1136. A conceptual model includes four elements: identification of PCOCs, characterization of the release of COCs, determination of migratory pathways, and identification of human receptors. Subsection 4.3.1 presents an overview of the selection of PCOCs at OU 1136. Subsection 4.3.2, Potential Environmental Pathways, discusses the potential contaminant release mechanisms and migration pathways for each category. Subsection 4.3.3, Potential Human Receptors, describes potential current and future receptors and potential exposure to site-related chemicals.

4.3.1 Potential Contaminants of Concern

The objectives of the Phase I environmental data collection activities, to perform a screening assessment decision, will be accomplished by

- confirming the presence or absence of anticipated PCOCs from known past site activities;
- using broad spectrum analytical methods that will allow for a reasonable determination that important additional PCOCs are not present (e.g., the evaluation of tentatively identified compounds from mass spectral scans); and
- selecting analytical methods primarily on the basis of sensitivity for anticipated PCOCs at their SALs and secondarily for broad-band-spectrum capability.

Data collected during Phase I will be used to determine if any sample contains a PCOC for which the PCOC's sample concentration exceeds its SAL.

Table D-1 in Appendix D lists the OU 1136 PCOCs that have been identified through archival information. Any chemical or radiological substance considered hazardous to human health will be identified in the RFI work plan for characterization sufficient to support a screening assessment decision.

The PCOCs in Table D-1 can be divided into four general categories: metals, organic compounds (non-metallic), inorganic compounds, and radionuclides. Radionuclides are the primary concern at OU 1136. Components used at Technical Area (TA)-43 that were not deemed to be hazardous to human health were not included in the table (i.e., phosphates, potassium). This work plan will focus on the PCOCs likely to present a significant risk.

4.3.2 Potential Environmental Pathways

The primary release mechanism of potential contaminants at OU 1136 is through operations associated with Los Alamos National Laboratory's (the Laboratory's) research activities and past disposal practices. Potential contaminants may have been released to the environment through drains or outfalls, or by leaking from sewer lines. After release into the environment, chemicals can potentially migrate via (1) liquid infiltration into near-surface or subsurface soils; (2) organic volatilization into ambient air; (3) wind entrainment of contaminated dust and deposition onto surface soils or vegetation; (4) surface water overflow and then runoff resulting in the contamination of sediments in drainage channels (refer to Chapter 3); (5) alluvial groundwater pathways; (6) uptake by and deposition on plants; and (7) uptake by animals via inhalation, ingestion, or dermal contact with contaminants.

The primary migration pathways and relevant contact media through which human exposure to residual contaminants could occur are summarized in Table 4-1. Uptake by animals from ingestion and inhalation of contaminated media may be a complete pathway but is considered the least significant in comparison to the other pathways listed in Table 4-1.

The thickness of the unsaturated zone beneath OU 1136 suggests that migration of contaminants from the surface to the main aquifer is unlikely, so groundwater transport in the main aquifer will not be considered a viable

TABLE 4-1

SUMMARY OF MAJOR MIGRATION PATHWAYS, CONTACT MEDIA, AND RESULTING POTENTIAL HUMAN EXPOSURE ROUTES

MIGRATION PATHWAYS	CONTACT MEDIA	RESULTING POTENTIAL HUMAN EXPOSURE ROUTES
Primary Liquid infiltration into near-surface or subsurface soils	1. Chemicals in subsurface soils	1. See B and C
Wind entrainment and dispersal of surface soil and atmospheric dispersion of volatiles	1. Chemicals deposited on surface soils and edible plant surfaces 2. Chemicals in air (particulate matter and volatile compounds)	1. Ingestion of soil, dermal contact with soil, and ingestion of plants 2. Inhalation of fugitive dust or volatile compounds
Surface water runoff carrying soil/sediment in suspension and contaminants in solution via groundwater	1. Chemicals deposited in drainage sediments 2. Chemicals released to surface waters 3. Contaminated surface water infiltrating uncontaminated surface soils and saturated alluvium	1. Ingestion of sediments and dermal contact with sediments 2. Ingestion of surface-/ groundwater and dermal contact with surface water 3. Ingestion of soil and dermal contact with soil
Secondary Root uptake by plants (from contaminated soils)	1. Edible portions of plants	1. Ingestion of plants
Uptake by animals (from ingestion and inhalation of contaminated media)	1. Contaminated meat	1. Ingestion of meat
Soil erosion, exposing subsurface contaminated soil to the surface	1. Feeds wind dispersal (B) and surface water (C)	1. See B and C

transport pathway at this stage of the RFI. (Refer to Subsection 2.6.2 of the IWP for a discussion of the hydrology of the main aquifer beneath OU 1136.) (LANL 1993, 1017)

Perched water could be present in OU 1136. Potential contaminant movement into perched water through fractures or faults in the subsurface is possible subsequent to infiltration or leaching into the vadose zone. However, perched water is not likely to be a pathway of major concern and will not be considered at this stage. Currently, there are no wells on site that are used as a source of drinking water.

It is possible that saturated alluvium in Los Alamos Canyon may have received contaminants from two outfalls at TA-43 at some time in the past.

Because this can be considered a potential water resource, the impact of this alluvial groundwater as a possible exposure pathway will be addressed further if sample analyses show contaminants at the outfalls. Additionally, sampling plans from OU 1098 and OU 1049, which focus on the canyons, should cover any contaminant problems in this alluvial aquifer.

4.3.3 Potential Human Receptors

This section discusses how people could potentially be exposed to site-related PCOCs in the absence of site remediation and presents the conceptual site model. At present, the land is used for Laboratory operations, so workers at OU 1136 represent the most likely current potentially exposed population on site. A public-access road used for hiking, bicycling, and jogging runs along Los Alamos Canyon, immediately to the south of the site. The canyon wall is not fenced or posted for restricted access, and intruders are possible. The nearest permanent residents to OU 1136 are within 110 ft of the site, in the town of Los Alamos across Diamond Drive to the west. Future land use at OU 1136 could encompass continued Laboratory operations, conversion to other commercial/industrial use, or residential use, all of which will be evaluated in a baseline risk assessment if one is deemed necessary. Recreational land use is not considered an option in this area at this time. Potential receptors for the Laboratory are discussed in Section 3.2.3.3 of Appendix K of the IWP (LANL 1993, 1017).

4.3.3.1 Conceptual Site Model

The on-site conceptual models identify historical sources of potential contamination, historical migration and conversion, potential current sources of contamination, release mechanisms, contact media, and exposure routes for each PRS. Conceptual exposure models are used to illustrate how chemicals can move in the environment from potential release sites to human receptors. They are used to help identify appropriate media and locations for sampling and to determine if the PRS poses a threat to human health or the environment.

Generally, surface soil is defined as the upper 6 in. and subsurface soil is from 6 in. to 12 ft or bedrock. At TA-43, the "A" soil horizon is generally less than 6 in. thick, so this sampling domain will generally include part of both the "A" and "B" soil horizons. Infiltration or leaching into the vadose zone is not a significant pathway unless contamination is located in subsurface soils. A summary of the conceptual model elements are presented in Table K-1 of the IWP (LANL 1993, 1017). These elements are used to create the site-specific conceptual model, which is presented in Chapter 5.

The conceptual model for OU 1136 was developed based on information currently available for each PRS. Additional models may be developed or the current model refined when additional data are gathered.

Site-specific information on the PRSs is presented in Chapter 5.

4.3.3.2 Potential Human Exposure

To identify the presence of COCs, sampling plans proposed for OU 1136 involve comparing analytical data from samples with SALs. As mentioned in Subsection 4.2.2, SALs are based on a conservative, residential exposure scenario. If measured concentrations exceed SALs or if several contaminants come close to SALs, then further investigation will be conducted (Appendix J of the IWP (LANL 1993, 1017). If contaminated media above SALs are found in Phase I of the investigation, and a VCA is not ordered based on Phase I data, the human exposure potential to these contaminants will be quantified in a baseline risk assessment. For OU 1136 PRSs, this will probably require further data obtained from additional sampling as part of a Phase II investigation. Human exposure will be estimated if a Phase II study is implemented to support a baseline risk assessment decision, and will take into account site-specific factors such as land use assumptions. Refer to Subsection 4.3 of the IWP for ER programmatic guidance on probable land use scenarios (LANL 1993, 1017). Land use issues are described in Section 3.2.3.2 of Appendix K of the IWP (LANL 1993, 1017).

Three land use scenarios will be considered for OU 1136 if a baseline risk assessment is performed: continued Laboratory operations (current and future), other commercial/industrial use (future), and residential use (future).

The continued Laboratory operations scenario encompasses two theoretical populations of potentially exposed individuals: on-site workers and construction workers. Although the site is posted for authorized access only, intruders or unauthorized visitors to the site are possible because of the proximity of OU 1136 to the town of Los Alamos. However, the duration of their exposure would be less than that of a Laboratory employee, and their contact with potentially contaminated media would be less than for construction workers.

4.4 Potential Response Actions

This section summarizes the potential response actions that may ultimately apply to OU 1136 PRSs. Remediation alternatives must achieve acceptable risk levels; however, choosing between alternatives that meet human health risk requirements will be based on factors such as ecological impact, cost, regulatory concerns (in addition to risk), impact on Laboratory operations, socioeconomic impacts, and public concern. All actions refer to potential or known surface soil problems that represent the contaminants of greatest concern at the site. Subsurface contaminants could require other technologies (e.g., steam injection for vadose zone contaminants).

4.4.1 Criteria for Recommending NFA

Chapter 6 presents detailed descriptions of the criteria used for recommending NFA or DA based on archival or historical information and the OU 1136 PRSs that are recommended for NFA or DA. NFA recommendations based on screening assessments are also possible depending on the results of the Phase I screening assessment surveys. These will include an evaluation of combined effects from multiple contaminants as described in Appendix J of the IWP (LANL 1993, 1017).

4.4.2 Access Restrictions

The OU 1136 PRSs are not within restricted Laboratory property, and "No Trespassing" signs are not posted. Access to PRSs within the Health

Research Laboratory Building is restricted to Laboratory employees and approved visitors. Access restrictions, if deemed necessary, would have to be implemented at the site.

4.5 Sampling Strategies

Sampling to support screening assessment decisions is proposed for this phase of the OU 1136 RFI. A component of the strategy for sampling to support screening assessment decisions is that sample locations may be selected on the basis of professional judgment about the most likely locations for contamination, if contamination exists. The sampling methods, standard operating procedures for sampling used in this RFI Phase I, and field surveys conducted during investigations are discussed in Appendix D.

4.5.1 Sampling to Support Screening Assessment Decisions

Sampling to support screening assessment decisions in this phase of the OU 1136 RFI involves selection of sample locations based on knowledge of the physical process responsible for the potential contaminant distribution in space (or time).

Sample data collected during Phase I will provide an observed maximum concentration of each PCOC. The observed maximum values will be compared with SALs (Subsection 4.2.2) to determine if no further action can be proposed or if some further action in the form of a Phase II study to support a full baseline risk assessment or a VCA can be proposed.

The data collected to support the screening assessment decision may be used in a preliminary risk assessment, should SALs be exceeded. If these data do not support a full baseline risk assessment decision, then a Phase II study to collect the appropriate data to support a risk assessment will be proposed.

4.6 Quality Assurance

4.6.1 Laboratory Quality Assurance Samples

Refer to Annex II and Table 5-2 for a description of the type and number of laboratory quality assurance samples. The purposes of these samples are to assess analytical precision and bias and to assess problems of cross-sampling and cross-contamination of samples stored and opened in the laboratory.

4.6.2 Field Quality Assurance Samples

The purpose of field quality assurance samples is to quantify the performance of a sampling technique (surface samples taken by a hand auger, boreholes taken by a diamond drill, etc.). Thus, adequate data should be collected within OU 1136 to evaluate each sampling method. Although many kinds of quality assurance samples can be collected (e.g., collocated samples, homogenate subsamples, field duplicates), the type and number of these samples depend on the major source of variation in the sample collection process. The implementation plan for OU 1136 will follow guidance in Chapter 4 and Annex II of the IWP (LANL 1993, 1017) and survey-specific requirements in determining the number and type of field quality assurance samples.

4.7 Recordkeeping and Field Logs

All records generated by OU 1136 field investigations will be processed and archived in accordance with the Records Management Plan presented in Annex IV of the IWP (LANL 1993, 1017). Records generated during field activities will be documented in the field log. Records documenting activities occurring after samples are shipped from the field to the analytical laboratory, including laboratory analyses, laboratory analytical results, data validation, data analysis, and preparation of the RFI Report will be archived in accordance with the records management plan.

A field log will be maintained during the sampling program. The log will document all field activities, including the sampling activity; record the information obtained from the field screening instrumentation; identify the procedures used in sampling and sample site selection; identify the personnel involved; and record any other information pertinent to the sampling process and to the quality of the results. Field logs maintained by individual field team members will be consolidated into a master log at the end of each major sampling activity (LANL-ER-SOP-1.04) (LANL 1993, 0875).

The completed field log will document the implementation of this work plan. Most importantly, it will document the site-specific decisions of the field team leader required under the phased approach presented in this plan, as well as any modifications to the plan required to address unanticipated site conditions. Because sampling and site characterization are essentially processes of discovery, minor modifications to the sampling plan and to its implementing procedures may occur. As a vehicle for documentation, the field log will be written to provide sufficiently comprehensive descriptions of the sampling activities and their rationale so that modifications to the work plan are not expected to be needed.

REFERENCES

EPA (US Environmental Protection Agency), July 27, 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule, Title 40 Parts 264, 265, 270, and 271, Federal Register, Vol. 55., pp. 30798-30884 (EPA 1990, 0432)

LANL (Los Alamos National Laboratory), January 1993. "Los Alamos National Laboratory Environmental Restoration Program Standard Operating Procedures," Los Alamos National Laboratory report, Los Alamos, New Mexico. (LANL 1993, 0875)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

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5.0 EVALUATION OF POTENTIAL RELEASE SITES

5.1 Sanitary Line 43-001(a1) and Outfalls 43-001(b2) and C-43-001

5.1.1 Background

The sanitary lines and outfalls at Technical Area (TA) 43 contain three potential release sites (PRSs) requiring investigation: former sanitary sewer line 43-001(a1) and two storm drain outfalls 43-001(b2) and C-43-001. These PRSs have surface and subsurface potential contaminants of concern (PCOCs) resulting from past activities (see Table D-1 in Appendix D). There is no quantitative historical data on the concentration or amount of potential contaminants. Phase I sampling will be taken to evaluate potential contamination that resulted from past activities.

5.1.1.1 Description and History

The Health Research Laboratory (HRL), completed in the summer of 1952, is a four-story structure measuring approximately 18,500 ft^2 per floor. The building is located on a mesa top on the north edge of Los Alamos Canyon roughly 250 ft east of Omega Bridge. TA-43 is located on the west side of Operable Unit (OU) 1136 at an elevation of 7,300 ft.

TA-43 was established in 1953 when the Health Research Building, TA-43-1, was first occupied by the Los Alamos National Laboratory's former Health (H) Division, which conducted biomedical and industrial hygiene research. The original emphasis was a mixture of basic and applied research to assess health effects of radiation and materials associated with laboratory operations. Trace amounts of a wide range of radionuclides, including uranium and plutonium, were used at the site. With completion of the Occupational Health Building at TA-59 in 1966, industrial hygiene activities were moved out of TA-43. The site has since focused on biomedical research conducted by Life Sciences (LS) Division.

Generally, experiments at HRL involved aspects of radiation exposure related to laboratory research. Research ranged from external irradiation of animals and cells (grown in cultures) to inhalation and metabolism studies where radioactive materials were placed in animals. In one series of experiments, many generations of mice were externally irradiated with low levels of radiation. However, these experiments were done with sealed sources and are not of concern to the Environmental Restoration (ER) Program. The building also contained sensitive whole-body counters for humans and animals. Animals were counted to determine the results of metabolism experiments. These early counters utilized large tanks of liquid scintillation fluid surrounded by photomultiplier tubes. The scintillation fluids were xylene- or toluene-based. Other experiments involved the use of plutonium-238, plutonium-239, promethium-147, polonium-210, strontium-90, and cesium-137. For some inhalation experiments, plutonium was labeled with cobalt-60 (because of the difficulty of counting plutonium in the lungs directly). In addition, phosphorus-32 and sulfur-35 are still used to label DNA. Carbon-14 and tritium were also used and would have been counted in liquid scintillation cocktails (Potter 1994, 23-0093).

Since its inception, the HRL has been involved in several surveys documenting potential contamination in laboratory buildings. In 1973, the HRL was listed as having low contamination of transuranics, fission products, and tritium. For a period of years, wastes in the sewer lines were sampled and analyzed, and radioactivity was found to be consistently low (LASL 1973, 23-0026). In 1979, HRL was noted to be one of the major generators of nonradioactive chemicals. These chemicals were acids, bases, organics, inorganics, reactive metals, and other chemicals requiring disposal. The disposal activities involved waste management personnel sorting, packaging, and transporting the chemicals to disposal areas. These chemicals were not disposed of through the sanitary system (Warren 1979, 23-0027).

PRS 43-001(a1). PRS 43-001(a1) was a sanitary sewer line that serviced TA-43-1. In 1963, the TA-45 treatment plant shut down, and TA-43-1 connected its industrial waste and sewer lines to the treatment facility in Bayo Canyon. During that time, composite samples of waste were collected and analyzed for radioactivity three times a week. Concentrations of radionuclides in these liquid effluents were kept well below Table II, AEC Manual 0524 guidelines and were usually less than 1/10 of these values (LASL 1973, 23-0026). In 1975, containers for radioactive wastes were placed in laboratories generating contaminated liquids. These containers were then transported to TA-50 to be treated (LASL 1975, 23-0025). Sanitary sewer lines continued to flow to the county system in Bayo Canyon until 1981 when drains were redirected into the TA-3 sanitary sewer system (LANL 1990, 0145).

During the time that TA-43-1 was connected to the Bayo Canyon facility, the 4-in. cast iron sewer line ran from a lift station (TA-43-10) located at the southeast side of HRL, to a county manhole located 315 ft to the northeast. The sewer line is roughly 30 ft below ground at the lift station and reaches a joint to the east at a depth of approximately 10 ft. where gravity then carries the flow to the county manhole to the northeast (Figure 5-1).

PRS 43-001(b2). This storm drain outfall was permitted under national polluntant discharge elimination system (NPDES) number 03A040 in the mid-to-late 1970s. The outfall takes effluent from the following sources: 6 floor drains from the sub-basement, blowdown from the evaporative cooler, and storm water received from 13 roof drains on the west side of HRL (Santa Fe Eng. 1992, 23-0071). These effluents are all discharged to the west of HRL through a 130-ft-long, 12-in. corrugated metal pipe (Figure 5-1).

In 1985, some once-through coolant water and treated coolant water from HRL were identified as being disposed of through the sanitary collection system. This water was potentially radioactive. It was recommended that this nonsanitary flow source be eliminated from the sanitary waste system. The 1988 Solid Waste Management Unit (SWMU) Report indicated an active outfall of noncontact cooling water from HRL (NPDES serial number 040/041 [later combined to become 03A040]), and Figure 43-1 of that report located it west of HRL (LANL 1990, 0145). The 1987 Comprehensive Environmental Asssessment and Response Program (CEARP) Report notes an old NPDES map showing a similar outfall location; thus, the outfall may also have received the once-through coolant water before NPDES permitting and certainly before the 1985 connections to the sewage system (DOE 1987, 0264). This is the outfall element of PRS 43-001(b2).

PRS C-43-001. C-43-001 is a storm drain outfall that drains into Los Alamos Canyon. The drain took storm water from the dock area of HRL and also doubled as an overflow line for the lift station (TA-43-10) mentioned in the summary for PRS 43-001(a1). The possibility exists that at some point the sanitary lines for HRL may have become clogged causing an overflow. Any hazardous waste being carried through the lines could have possibly

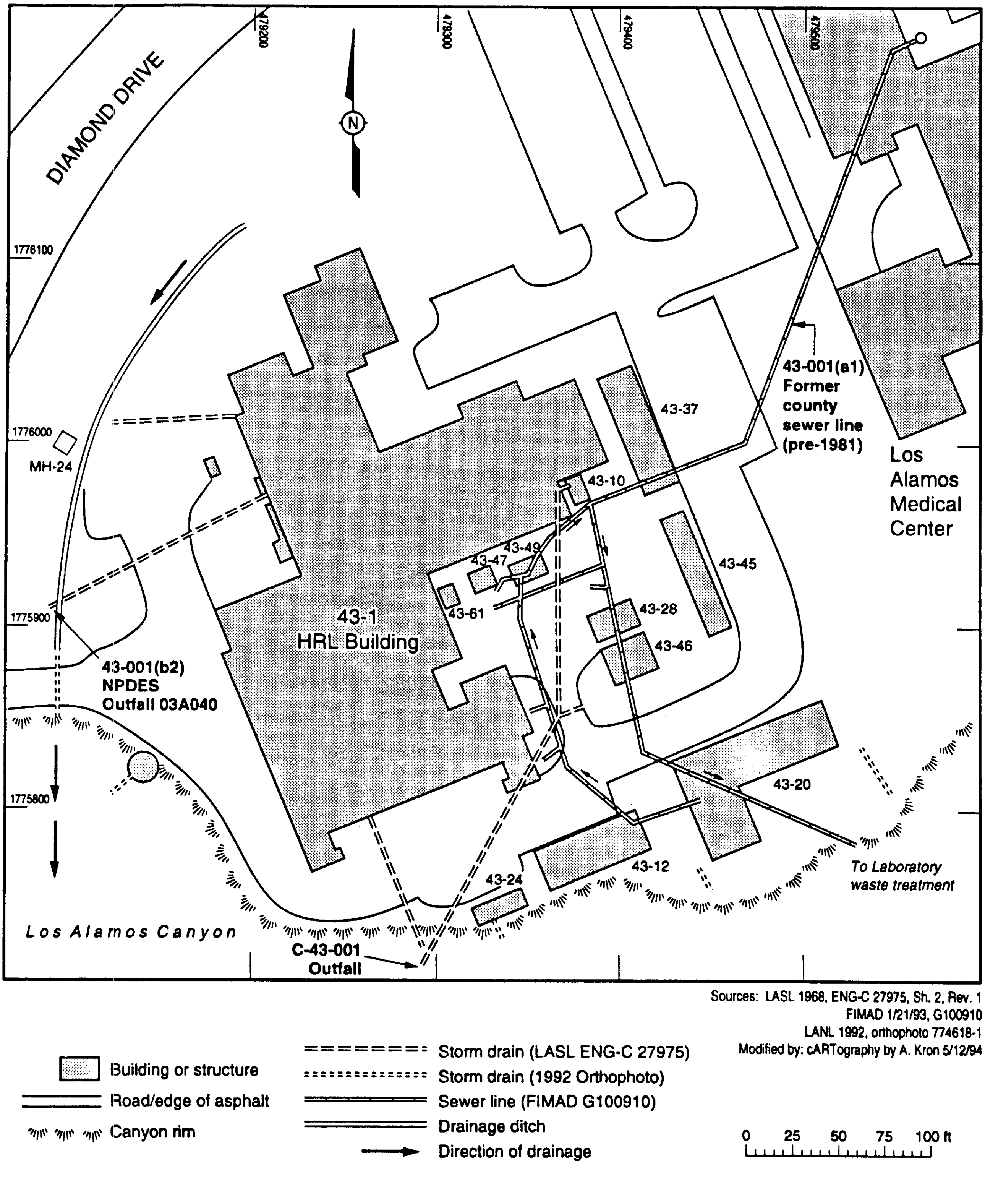

Figure 5-1. Locations of PRSs in TA-43 to be sampled.

discharged into the storm drains. Although no record was found that documents any type of routine releases into the storm drain, this outfall may have received potentially radioactive, nonsanitary cooling water as described above and therefore is considered an area of concern (AOC).

The 8-in. overflow line, made of vitrified clay, extends 130 ft south from the lift station to a manhole. A 12-in. corrugated metal pipe, containing discharge from two storm drains and any effluent from the overflow, flows southwest for 160 ft and drains into Los Alamos Canyon (Figure 5-1).

5.1.1.2 Conceptual Exposure Model

5.1.1.2.1 Nature and Extent of Contamination

PRS 43-001(a1) is a disconnected sanitary sewer line. During at least a portion of its useful life, low levels of radioactive materials and other chemicals [alcohol, acetonitrile, chloroform, aqueous solutions of organic salts, phosphate-buffered saline, acids, and bases] were disposed of via this line (Watanabe 1993, 23-0092). Transuranics, fission products, and naturally-occurring radioactive materials were used in experiments and may have been released into the sanitary sewer. However, there are several factors that would have mitigated the amount and toxicity of the radioactive material released. First, there were standards in existance that limited the concentration of radioactive material that could be released via sewers (Standards for Radiation Protection, Chapter 0524, US AEC Manual, November 8, 1968). Available information indicates that the concentration of radionuclides in the line was less than the standards for release in liquid effluent to uncontrolled areas in use at the time (10^{-3} to 10^{-8} microcuries per milliliter, depending on the isotope) (LASL 1973, 23-0026). Second, much of the radioactive material administered to laboratory animals remained with the animal or was excreted in feces or urine, which was absorbed and disposed of as solid waste along with the carcasses. Third, many of the radiotracers used in biomedical research have either short half-lives (for example, iodine-125) or low radiotoxicity (for example, tritium or carbon-14). No quantitative information is available that indicates either the level of residual contamination in the line or the level of contamination, if any, that may have leaked from the line to the surrounding soil.

PRS C-43-001 and the outfall associated with PRS 43-001(b2) consist of two active storm drain outfalls that empty toward Los Alamos Canyon to the south. The C-43-001 storm drain was connected to the overflow line from the lift station that served the former PRS 43-001(a1) sanitary line. Although there are no records that indicate that this occurred, an overflow event could have carried contamination similar to that found in the sanitary line to the outfall. The other storm drain outfall [PRS 43-001(b2)] is currently active and discharges nonhazardous water. However, there is speculation that it may have discharged radioactively contaminated water and/or treated cooling water in the past. No quantitative information is available on possible residual contamination as a result of the discharges from either of the outfalls.

5.1.1.2.2 Potential Pathways and Exposure Routes

The conceptual exposure model is presented in Figure 5-2. A summary of exposure mechanisms and human receptors is presented in Table 5-1.

Contamination from the inside of the sanitary line could have leaked or spilled to the outside during its operation, contaminating the surrounding subsurface soils. The line itself or any sludge in it may contain residual contamination. Erosion or, more likely, construction activities could expose humans to contaminated soil via inhalation of fugitive dust or volatiles, incidental ingestion of soil, dermal contact with soil, or external irradiation.

Wind dispersion of contaminants on the surface of outfalls may have occurred. The mesa in this area slopes generally to the south where a drainage channel is evident at each outfall. On this basis, surface water runoff is considered to be a major pathway. Current or future receptors could be exposed to contaminants by inhalation of fugitive dust or volatiles, incidental ingestion of soil, dermal contact with soil, or external irradiation.

5.1.2 Remediation Decisions and Investigation Objectives

5.1.2.1 Problem Statement (DQO Step 1)

This OU contains three PRSs associated with liquid waste discharge from HRL. The objective of the Phase I sampling is to determine if concentrations of potential contaminants at discharge areas, leakage points, or in remaining

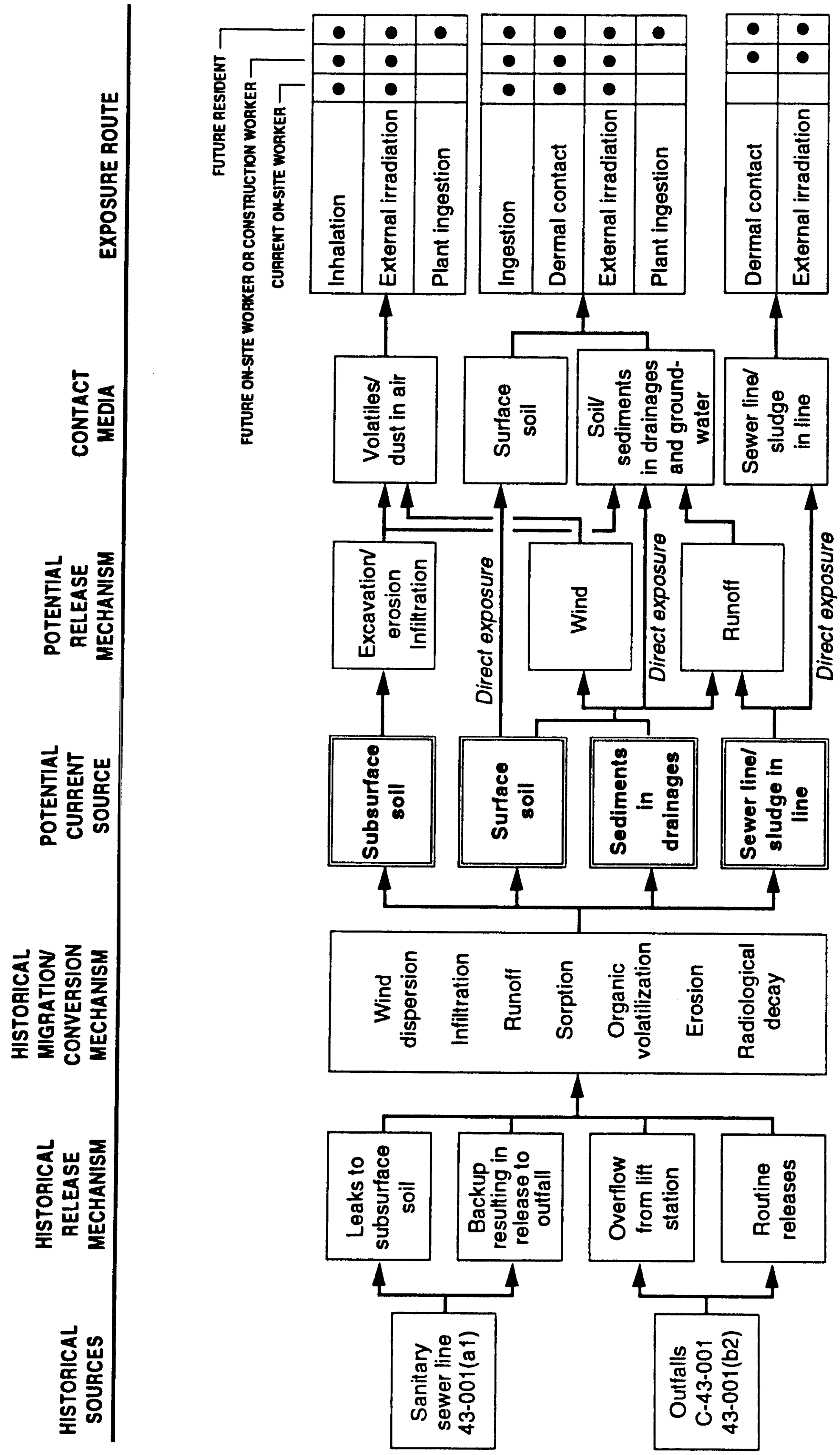

Figure 5-2. Conceptual exposure model for OU 1136 sanitary line and outfalls.

TABLE 5-1

POTENTIAL RELEASE SITE
EXPOSURE MECHANISMS AND RECEPTORS

PRS	POTENTIAL AREA OF CONTAMINATION	RELEASE MECHANISM	CURRENT POTENTIAL RECEPTORS	FUTURE POTENTIAL RECEPTORS
43-001(a1) (pre-1981)	Sanitary line	Excavation or erosion exposing line External irradiation	None	Construction workers On-site workers Residents
	Sludge inside sanitary line	Leaks to surrounding subsurface soil External irradiation	None	Construction workers On-site workers Residents
	Subsurface soil surrounding sanitary line	Excavation or erosion, resulting in wind dispersion, surface water runoff and infiltration, and external irradiation	None	Construction workers On-site workers Residents
C-43-001 43-001(b2)	Surface soil and sediments in outfall drainages and alluvial aquifer	Wind dispersion Surface water runoff Groundwater External irradiation	On-site workers	Construction workers On-site workers Residents

structures are above screening action levels (SALs). Current Laboratory waste management practices preclude additional potential contaminants of concern (PCOCs) from being discharged at these locations.

5.1.2.2 Decision Process (DQO Step 2)

If Phase I sampling indicates that all PCOCs are below SALs or are within the background range, then no further action (NFA) will be proposed for a PRS. If Phase I sampling of any media shows contaminants above SALs then further action will be taken. This may consist of performing a voluntary corrective action (VCA) or a baseline risk assessment for current and future use of the site. This risk assessment may require additional data to be collected as part of a Phase II investigation.

5.1.3 Data Needs and Data Quality Objectives

5.1.3.1 Decision Inputs (DQO Step 3)

Data needs for these PRSs consist of identification and concentrations of potential contaminants in soils and tuff in the discharge or leakage areas and in the potentially contaminated pipe.

5.1.3.2 Investigation Boundary (DQO Step 4)

The Phase I investigation for the outfall PRSs, 43-001(b2) surface discharge and C-43-001 storm water runoff discharge, will involve sampling sediments and tuff in drainages from each outfall to a depth of 18 in. for a distance of up to 50 ft downgradient from each discharge point. It is assumed that the highest levels of potential contamination will remain near the discharge source and that the PCOCs may have accumulated in sediment traps on the drainage paths. Of course this assumption depends on flow rates. If Phase II investigations prove necessary, sampling may be expanded to include the piping systems for these outfalls and additional sediments further downstream from the outfalls.

The Phase I investigation for the buried pipe portion of PRS 43-001(a1) will first take samples from the pipe and any residual sediment for a distance of three pipe sections south from the large manhole in the parking lot and then sample the sediments or tuff underlying these three sections to a distance of 18 in., particularly the regions directly adjacent to the pipe joints. These pipe sections are selected to represent any potential contamination in the system because they are the first sections that are accessible to excavation without disturbing existing buildings or the extensive piping system for TA-43-1. If Phase II investigations prove ncessary for this PRS, sampling would be expanded to include the remainder of the decommissioned pipe and the soil or tuff adjacent to that pipe.

5.1.3.3 Decision Logic (DQO Step 5)

For a given PRS, if the observed sample maximum concentration of any PCOC is above its SAL, then consider further action, otherwise propose NFA for that PRS. Further action will initially consist of performing a preliminary baseline risk assessment. If the data prove sufficient to support a full baseline risk assessment decision, then potential decision actions include proprosing NFA, performing a VCA, or performing a corrective measures study. If the data collected to support the screening assessment decision do not adequately support a full baseline risk assessment decision, then additional data will be collected as part of a Phase II investigation.

The data for the pipe segments will be used to determine the disposal option for that pipe, which may receive a VCA following excavation.

5.1.3.4 Design Criteria (DQO Step 6)

Sampling designs to support a screening assessment decision will be used for all of these PRSs. The rationale for biasing the samples to points adjacent to leakage points and discharge points for all PRSs is the assumption that PCOC concentrations will be high at these points. Several samples in each drainage are required because flow rates are likely to have been high, particularly at PRS C-43-001, which received storm water runoff from a wide area. The downstream samples at each outfall are biased to regions in which the drainage channel slopes become shallow, sediment traps form, and PCOCs are likely to be concentrated.

Each 18-in. sample will be divided into three 6-in. segments that will be field-screened for radionuclides and volatiles to select the portion of each sample that will be sent for laboratory analysis.

Three laboratory samples from each sampling site, including both the pipe and the geologic media surrounding the pipe, will be analyzed. During Phase I investigations the rationale used for taking this number of samples is that contamination is not expected to be found at levels greater than SALs. Historical evidence indicates that, as a worst case, only very low levels of constituents may be present at these PRSs. The sampling plan is sufficient, considering the biasing of sample locations, to determine if the historical evidence is readily substantiated.

5.1.4 Phase I Sampling and Analysis Plan

Phase I sampling will focus on determining the presence or absence of PCOCs above SALs. A Phase II sampling plan, if necessary, will further define the nature, extent, and rate of migration of any release identified in Phase I in order to support a risk asssessment decision. Refer to Appendix

D (Field Investigation Approach and Methods) for additional OU 1136 field sampling information, including standard operating procedures (SOPs) used in this sampling plan. PCOCs for the PRS are delineated in Table D-1 of Appendix D. The Site-Specific Health and Safety Plan is presented in Annex III.

Field Screening. All samples will be field screened for gross alpha, -beta, and -gamma to detect the presence of the radionuclides. All samples will be screened by x-ray fluorescence for metals and by a photoionization detector for volatile organics. Appropriate health and safety precautions will be undertaken according to the Laboratory's ER Program SOPs (LANL 1993, 0875).

5.1.4.1 Engineering Surveys

Engineering surveys will locate, stake, and document PRS boundaries and areas for surface and subsurface sampling, the area to be excavated, and all pertinent structures and geomorphic features. All sample locations will be registered on a base map, scale 1:7,200. In the event any sample points must be relocated, the new position will be resurveyed, and the revised locations will be indicated on the map. The engineering survey will be performed by a licensed professional under the supervision of the field team leader.

5.1.4.2 Sampling

Sampling Rationale. The PRSs considered in this sampling plan are associated with liquid waste discharge from HRL, TA-43-1. Sampling will focus on the discharge points (outfalls), possible leakage points beneath excavated sections of pipe, and the interior of the excavated sections of sanitary sewer pipe.

5.1.4.2.1 Sampling Techniques

Samples taken from three boreholes at each of the storm drain outfalls [43-001(b2) and C-43-001] will be collected with a hand auger and thin-wall tube sampler and advanced to a depth of 18 in. Three 6-in. analytical samples will be removed from each sample hole. These three samples will be screened for radiation and volatiles, and the segment with the highest readings will be selected for full laboratory analysis.

Sampling specified to collect sediment from the interior of the sewer pipe [PRSs 43-001(a1)] will be performed by gathering any sludge or sediment by means of the spade technique. If insufficient material is available to collect a sediment sample, then swipes of the pipe interior will be collected for radiation and volatile organic analysis. The specific collection technique will be determined by the field team leader.

See Figures 5-3 and 5-4 for planned sample locations and Table 5-2 for a list of planned sampling activities.

5.1.4.2.2 Sampling Summaries

PRS 43-001(a1), Abandoned Sanitary Sewer Line, pre-1981. This sanitary sewer line is routed from a lift station (TA-43-10) at the southeast side of the HRL toward the parking lot to the northeast. The line is accessible and its entry is exposed in the lift station building. A swipe sample will be gathered at this opening. A probe will be inserted from the lift station terminus of the pipe and sent toward the joint where the line changes direction to the north-northeast. The probe data will be used to determine the approximate position that corresponds to the joint. If contaminants have leaked from the pipe, the leakage most likely occurred at the joint.

The soil will be excavated to approximately 10 ft to expose the sewer line at the joint. The first 20 ft of pipe from the excavation back toward the lift station will be excavated. Soil will be returned to the AOC upon completion of sampling and analysis. Hand auger samples will be taken on the upflow side of the joint, and one on the downflow side of the joint. One additional hand auger sample will be collected beneath the end of the 20-ft section of removed pipe toward the lift station. The hand auger and thin-wall tube method will be used to collect these samples to a depth of 18 in. Each hand auger sample will yield three 6-in. analytical samples with the one with the highest field screening readings submitted for full laboratory analysis.

Three sediment samples will be collected from the interior of the 20-ft section of excavated pipe. The highest readings in the pipe will dictate the sediment sample collection locations.

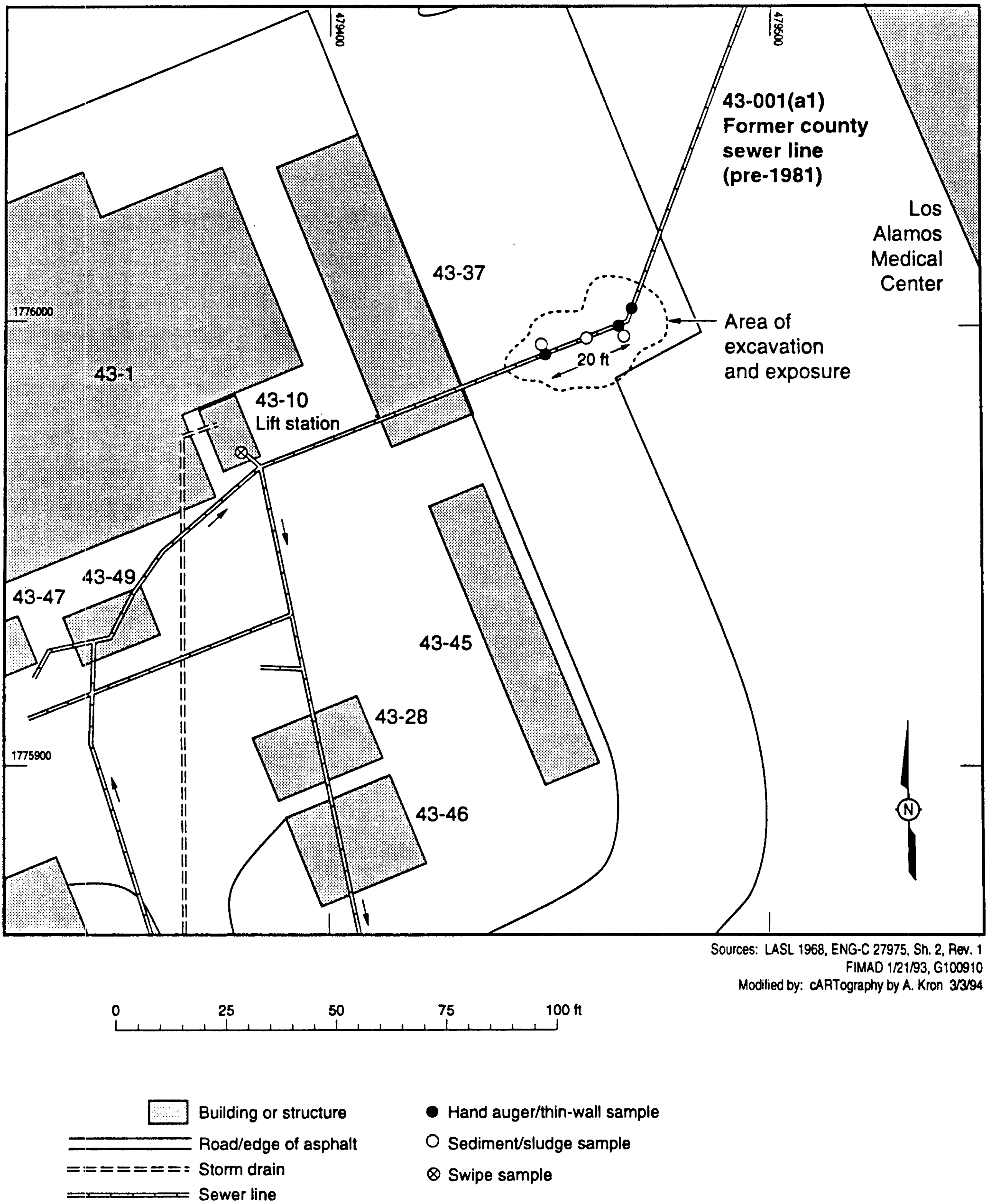

Figure 5-3. Sampling locations for 43-001(a1) sewer line (pre-1981).

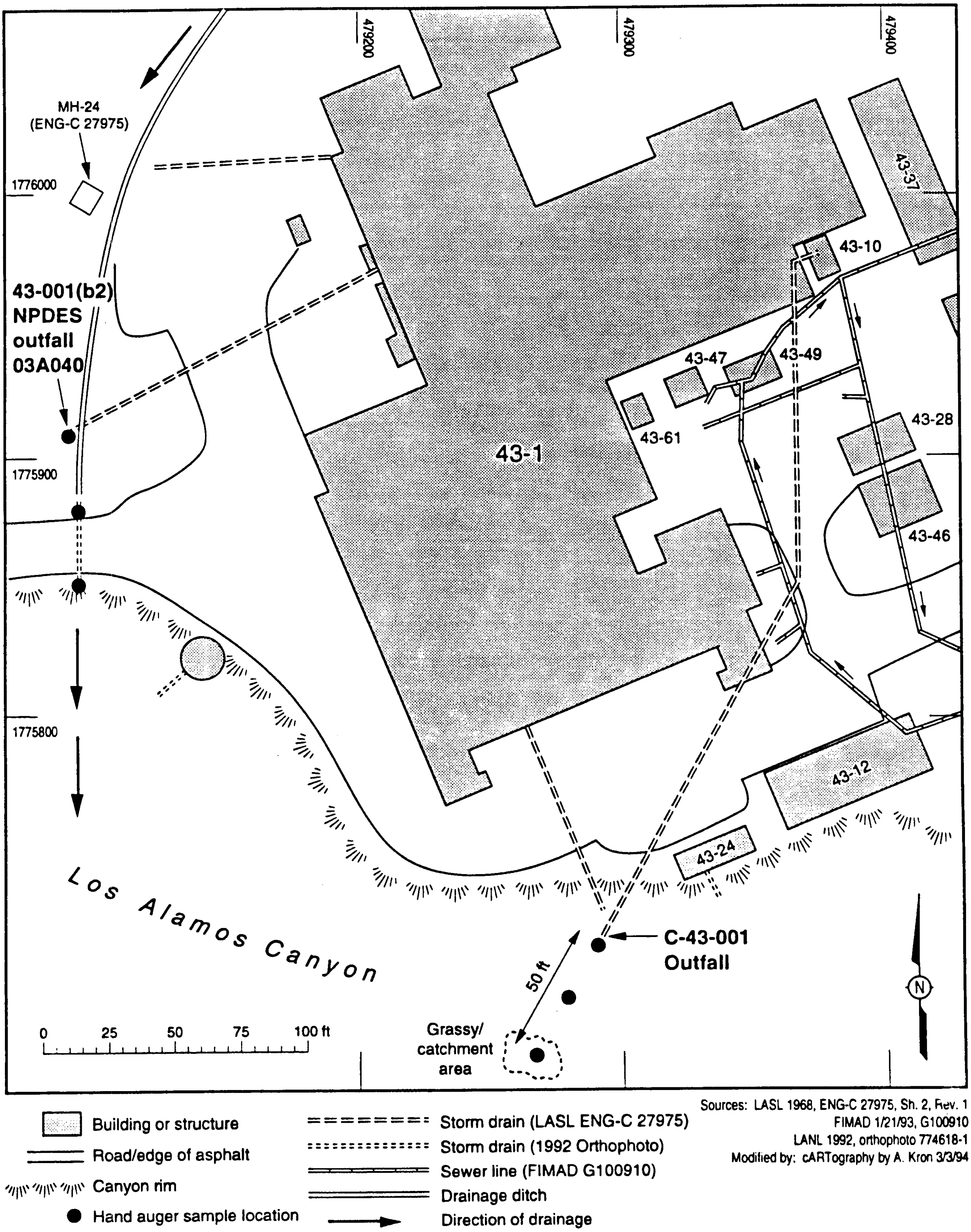

Figure 5-4. Sampling locations for outfalls 43-001(b2) and C-43-001.

TABLE 5-2

PRS-SPECIFIC SITE SURVEY AND SAMPLING SUMMARY

PRS	PRS TYPE	SWMU/OUTFALL TYPE	SAMPLE NOTES	PHASE I APPROACH	FIELD SURVEYS: LAND SURVEY	FIELD SURVEYS: RADIATION	SAMPLING GROUP INFORMATION: SAMPLED MEDIA	SURFACE	SAMPLE TYPE	NUMBER OF SAMPLES	PERFORMANCE EVALUATION
C-43-001	AOC	Storm drain outfall	Three thin-wall tube samples, 0 to 18 in. One at outfall, one 25 ft down drainage, and one in grassy area.	Screening Assessment	x	x	Soil/tuff	3	H	3	1
43-001(b2)	AOC	NPDES outfall 03A040	Three thin-wall tube samples, 0 to 18 in. One at outfall, one immediately before passing beneath road, and one at second "outfall" immediately after road.	Screening Assessment	x	x	Soil/tuff	3	H	3	0
43-001(a1)	SWMU	Sanitary sewer line	Three thin-wall tube samples, 0 to 18 in. One at either side of joint, and one at end of 20-ft section of pipe toward lift station.	Screening Assessment	x	x	Soil/tuff	3	H	3	1
43-001(a1)	SWMU	Sanitary sewer line	Three sediment samples from inside the first three sections of pipe.	Screening Assessment	x	x	Sediment	3	SS	3	0
43-001(a1)	SWMU	Sanitary sewer line	One swipe sample at entry of pipe in lift station.	Screening Assessment	x	x	Sediment	1	SW	1	0
Sampling Totals								13		13	2

Notes: H = hand auger sample.
SS = sediment/sludge sample.
SW = swipe sample.

PRSs C-43-001 and 43-001(b2), Outfall, Storm Drain Outfalls. These two storm drain outfalls flow into Los Alamos Canyon. The first storm drain collected runoff from the loading dock of the HRL and also functioned as the overflow from the lift station (TA-43-10). The drain line flows into the canyon to the south of the HRL. The second storm drain is currently covered under NPDES permit number 03A040 and receives effluent from floor and roof drains and from cooling system blowdown. This drain exits the HRL on the west into a drainage ditch that flows to the south toward the canyon.

Three surface soil samples (0 to 18 in.) will be collected at each storm drain; the first immediately below the outfall, the second approximately 25 ft down the drainage, and the third approximately 50 ft down the drainage from the outfall.

Each hand auger sample will yield three 6-in. analytical samples with the one with the highest field screening readings submitted for full laboratory analysis.

5.1.4.3 Laboratory Analysis

Fixed-Base Laboratory. Fixed-base laboratory analyses for radionuclides, metals, and semivolatiles will be based upon the following methods: LANL or DOE methods for alpha-, beta-, and gamma spectrometry; SW-846 Method 6010 for metals; and SW-846 Method 8270 for semivolatiles.

5.1.4.4 Sample Quality Assurance

Field quality assurance samples will be collected according to the guidance provided in the latest revision of the Laboratory's Installation Work Plan (Chapter 4; Annex II) (LANL 1993, 1017). Any performance evaluation samples planned to be collected during the course of the field investigation are outlined in Table 5-2.

REFERENCES

DOE (US Department of Energy), October 1987. "Phase I: Installation Assessment, Los Alamos National Laboratory," Volumes 1 and 2, (draft), Comprehensive Environmental Assessment and Response Program, Albuquerque Operations Office, Albuquerque, New Mexico. (DOE 1987, 0264)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. (LANL 1990, 0145)

LANL (Los Alamos National Laboratory), January 1993. "Los Alamos National Laboratory Environmental Restoration Program Standard Operating Procedures," Los Alamos National Laboratory report, Los Alamos, New Mexico. (LANL 1993, 0875)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987 Los Alamos, New Mexico. (LANL 1993, 1017)

LASL (Los Alamos Scientific Laboratory) July 1, 1973. "Radioactive Waste Management Site Plan," Los Alamos Scientific Laboratory report, ER ID No. 0008902, Los Alamos, New Mexico. (LASL 1973, 23-0026)

LASL (Los Alamos Scientific Laboratory), 1975. "A Survey of Liquid Waste Management Problems at the LASL," Los Alamos Scientific Laboratory report, ER-ID No. 0008076, Los Alamos, New Mexico. (LASL 1975, 23-0025)

Potter, E., January 5, 1994. "Interview with Julie Wilson, HRL (1/4/94)," Los Alamos National Laboratory Memorandum ESH-12:94-12 to File from E. Potter (ESH-12), Los Alamos, New Mexico. (Potter, 1994, 23-0093)

Santa Fe Engineering, Ltd., November 1992. "Wastewater Stream Characterization for TA-43 at Los Alamos National Laboratory—An Environmental Study," (draft), prepared by Santa Fe Engineering, Ltd., under Contract 9-XG8-2874P-1, Santa Fe, New Mexico. (Santa Fe Eng. 1992, 23-0071)

Warren, J., September 1979. "Waste Management Site Plan," Los Alamos Scientific Laboratory Report LA-UR-80-2836, ER-ID No. 0008907, Los Alamos, New Mexico. (Warren 1979, 23-0027)

Watanabe, S., December 15, 1993. "Telephone Interview with Thomas Whaley Concerning PCOCs (12/15/93)," Los Alamos National Laboratory Memorandum CST-ER SW93-013 to File from S. Watanabe (Ewing Technical Design), Los Alamos, New Mexico. (Watanabe 1993, 23-0092)

Executive Summary

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Chapter 6
PRSs Recommended for No Further Action or Deferred Action

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Appendices

Chapter 6

- PRSs Recommended for Deferred Action
- PRSs Recommended for No Further Action

6.0 POTENTIAL RELEASE SITES RECOMMENDED FOR NO FURTHER ACTION OR DEFERRED ACTION

This chapter identifies those potential release sites (PRSs) that do not require a current Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). All PRSs covered in this chapter are recommended for no further action (NFA) or deferred action (DA). The locations of these PRSs are shown in Figure 6-1. The following evaluation criteria are used to propose NFA and DA following archival investigation of Operable Unit (OU) 1136 PRSs.

1. NFA: Archival or historical evidence provide a clear indication that no operational activities at the PRS involve, or involved, the use, treatment, storage, or disposal of hazardous or radionuclide materials that pose a threat to on-site or off-site workers, the general public, or the environment.

2. DA: The PRS is an active Laboratory site, and there is no credible off-site pathway that would cause a contaminant threat to human health or the environment.

3. DA: The PRS is an inactive Laboratory site that does not pose a threat to human health or the environment, and characterization would disrupt current activities at an active site.

These criteria are consistent with regulatory and the Laboratory's Installation Work Plan guidance; where OU 1136 is concerned, these criteria make operational the definitve requirements laid out in those guidance documents. The PRSs listed in Table 6-1 are recommended, according to the above criteria, for either

- NFA and removal from the Solid Waste Management Unit (SWMU) Report or

- DA, resulting in deferred characterization until the site is decommissioned if the PRS is an active operation, or is intimately associated with an active operation that presents no current human health or environmental risk.

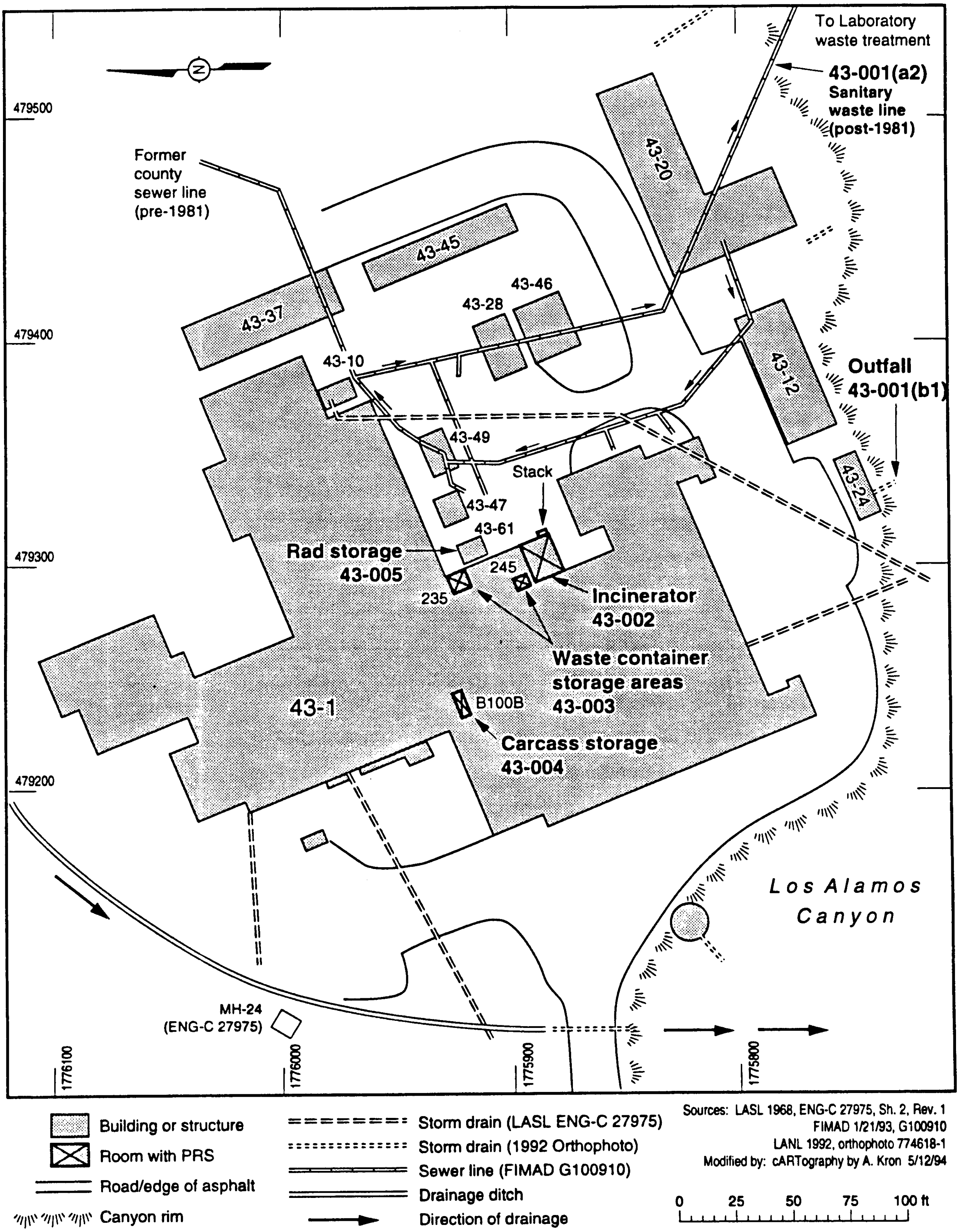


Figure 6-1. Locations of PRSs that are being considered for no further action or deferred action.

TABLE 6-1

PRSs RECOMMENDED FOR NO CURRENT RCRA FACILITY INVESTIGATION

PRS DESCRIPTION	EVALUATION CRITERION	SUBSECTION
43-001(a2), sanitary line (post-1981)	2 (DA)	6.1.1
43-002, incinerator	3 (DA)	6.1.2
43-001(b1), outfall	1 (NFA)	6.2.1
43-003, waste container storage areas	1 (NFA)	6.2.2
43-004, carcass storage	1 (NFA)	6.2.3
43-005, radioactive liquid waste storage	1 (NFA)	6.2.4

The first column of Table 6-1 provides the number/letter designation of the PRS (as listed in the current PRS data base) and the description of the site. The second column of the table indicates which of the criteria was used in recommending NFA or DA for the PRS identified in the first column. The third column lists the subsection in Chapter 6 that covers the PRS.

A detailed description of each PRS, the rationale for the associated decision, and applicable references are contained in the subsection of Chapter 6 devoted to that particular PRS.

6.1 PRSs Recommended for Deferred Action

6.1.1 Sanitary Line (Post-1981), PRS 43-001(a2)

6.1.1.1 Background

PRS 43-001(a2) is defined as the post-1981 sanitary waste disposal system that was redirected to the Technical Area (TA)-3 sanitary sewer system in 1981 and in 1992 again redirected to the Laboratory sanitary waste system consolidation facility. However, as discussed in Chapter 5 under PRS Outfalls 43-001(b2) and C-43-001, in 1985, once-through cooling water and treated cooling water were identified as being disposed of through the sanitary collection system. This water was potentially radioactive, and it was recommended that this nonsanitary flow source be eliminated from the sanitary waste system. Also, until 1987, all photoprocessing chemicals were disposed of down the drains and into the sanitary waste system. After 1987, recovery units, collection points, and the types of chemicals being used were upgraded in an attempt to eliminate hazardous constituents (LANL 1990, 0145). Currently both the photographic developer and fixer are collected and recycled under the Genomics and Structural Biology Group (LS-2) Standard Operating Procedure (Wilson 1992, 23-0043) (Figure 6-1).

6.1.1.2 Recommendation

PRS 43-001(a2), sanitary line (post-1981), is recommended for DA until the site is decommissioned because the existing sanitary waste collection and disposal system is part of and serves an active experimental site.

6.1.1.3 Rationale for Recommendation

There are no known, documented leaks in the sanitary waste line currently serving TA-43, and this site does not present a current human health or environmental risk on or off site (LANL 1993, 1017). Hence, category 2 applies for recommending DA.

6.1.2 Incinerator, PRS 43-002

6.1.2.1 Background

PRS 43-002 was an incinerator used in TA-43-1 to dispose of wastes generated by health research activities (LANL 1990, 0145). A memo dated April 20, 1967, describes it as a 400,000 BTU/hour gas burner with a 100 lb/ hour pathological organic waste capacity. At that time, the daily throughput was 5 to 10 lb of rats and mice, and 8 to 12 lb of paper with small amounts of wood shavings from animal cages. It was stated that no radioactive material was burned. The unit was installed in TA-43-1 Room B-137 in 1952 (Mitchell 1967, 23-0046). One long-time employee has indicated her belief that from 1960 to 1975, the incinerator was used to destroy animal carcasses contaminated with tracer quantities of nontransuranic isotopes (Watanabe 1993, 23-0039).

Based on a conversation with Ernesto A. Vigil who worked at TA-43-1 from the early 1960s to the mid-1970s, the incinerator was modified in the late 1960s or early 1970s. A second burner was added because the air flow in the incinerator was not flowing properly which resulted in periodic backdrafts and smoke entering B-137. The stack was also increased in height to prevent the smoke from periodically reaching the ground in the vicinity of TA-43-1 (Watanabe 1993, 23-0083).

In 1992, the room used for the incinerator was remodeled for use as a computer room, and the incinerator itself was removed. During the remodeling process, the entire room was subjected to a large area swipe survey with no detectable activity found. When the incinerator was removed, the health monitor found 1,000 dpm fixed on the interior surfaces (direct frisk), and the large area swipes revealed no detectable activity (LANL 1992, 23-0058). The passage to the stack has been sealed off with concrete mortar, and the top of the stack has been blocked with a stack cover. The ash pit remains, and the cleanout door is located on the east wall of TA-43-1 (Watanabe 1993, 23-0076). An analysis of the ash was recently performed by the Analytical Chemistry Group (CLS-1) (now CST-1) at the Laboratory. The results indicated cesium-137 concentrations of 6 +/- 3 nCi total radioactivity. The acid leach was counted using a liquid scintillation method) (Phillips 1993, 23-0066) (Figure 6-1).

6.1.2.2 Recommendation

PRS 43-002, incinerator, is recommended for DA until the site is decommissioned because the remaining system components (the stack and the ash pit) are within an active Laboratory site and within Building TA-43-1. Characterization of this inactive PRS would disrupt active operations. Neither the stack nor the ash pit presents a current human health or environmental risk on or off site (LANL 1993, 1017). Hence, category 3 applies for recommending DA.

6.1.2.3 Rationale for Recommendation

The remaining elements of this PRS are inactive and capped off and characterization and potential remediation can be safely deferred until the site is decommissioned. A lock is to be placed on the ash pit cleanout door and administrative controls will be implemented by the operating division to guide any future need for entry before decommissioning activities.

6.2 PRSs Recommended for No Further Action

6.2.1 Outfall PRS 43-001(b1)

6.2.1.1 Background

PRS 43-001(b1) is described in the SWMU Report as a pipe at the back of TA-43-24 (a transportable building) that discharges from a drinking fountain (LANL 1990, 0145). A field visit to this building has found that the original drinking fountain has been replaced by a sink that is used for washing hands. The TA-43 building manager states that TA-43-24 has always functioned as an office and that there have never been any hazardous materials stored in the building. The health protection technician for TA-43 has conducted a swipe test at TA-43-24, found no readings significantly above background, and considers the area free of radioactive contamination (Watanabe 1993, 23-0074) (Figure 6-1).

6.2.1.2 Recommendation

PRS 43-001(b1) is recommended for NFA and removal from the SWMU Report because no hazardous waste or constituents were managed at the unit and there is no evidence of a release. Hence, category 1 applies for recommending NFA.

6.2.1.3 Rationale for Recommendation

No documentation has been found that would indicate that there is any risk associated with this PRS.

6.2.2 Waste Container Storage Areas, PRS 43-003

6.2.2.1 Background

PRS 43-003 is described as two separate areas: a small area within TA-43-1 that is used as a satellite storage area where materials are kept in a locked closet in Room B-127; and a photoprocessing laboratory storing chemical waste (LANL 1990, 0145).

Further investigation of the first of these two areas as part of the RFI work plan process has revealed that B-127 was used for several years as a break room for animal colony workers but in the late 1980s was converted to a storage room for miscellaneous items. Currently the room houses a freezer used to store materials used in experiments. Bud Whaley, LS-2 Group Leader and a long-time employee in TA-43-1, believes that B-127 was misidentified as a satellite storage area and that the "locked closet" was B-236. B-236 was initially used as a clean chemical storage room and five or six years ago was designated as a satellite storage area for waste products. B-236 remained a satellite storage area until 1990 when the area was moved to a dock located on the south side of TA-43-1 (Watanabe 1993, 23-0057).

Photoprocessing is done in Rooms B-235 and B-245. Before 1990, the photoprocessing wastes were disposed of into the sanitary sewer system. Beginning in 1990, the developer and fixer were collected for recycling, and in 1992 the process was formalized and is currently conducted under a standard operating procedure (SOP) (Wilson 1992, 23-0043) (Figure 6-1).

6.2.2.2 Recommendation

PRS 43-003 is recommended for NFA and removal from the SWMU Report because no hazardous waste constituents were managed at the unit, and there is no evidence of a release. Hence, category 1 applies for recommending NFA.

6.2.2.3 Rationale for Recommendation

Both locations associated with PRS 43-003 are within building TA-43-1, and no documentation has been found to indicate that there is any risk associated with this PRS. Under Subsection 6.1 of this work plan the sanitary sewer line that received the photoprocessing chemicals will be investigated upon the decommissioning of TA-43.

6.2.3 Carcass Storage, PRS 43-004

6.2.3.1 Background

PRS 43-004 is described in the SWMU Report as the freezers in TA-43-1 in which animal carcasses are stored before being drummed for shaft disposal at Material Disposal Area G (LANL 1990, 0145). The freezer is currently located in Hallway B-100B, although in the past it may have been located elsewhere within TA-43-1. (Figure 6-1)

6.2.3.2 Recommendation

PRS 43-004 is recommended for NFA and removal from the SWMU Report because no hazardous waste or constituents were managed at the unit, and there is no evidence of a release. Hence, category 1 applies for recommending NFA.

6.2.3.3 Rationale for Recommendation

The location associated with PRS 43-004 is within TA-43-1, and no documentation has been found to indicate that there were any hazardous wastes or consituents managed at this unit or any evidence of a release associated with this PRS.

6.2.4 Radioactive Liquid Waste Storage, PRS 43-005

6.2.4.1 Background

PRS 43-005 is described in the SWMU Report as the containers that were placed in the TA-43-1 laboratories starting in 1975 for the storage of radioactive-contaminated liquid waste. It was later designated as an area of concern. The waste is periodically collected for treatment at TA-50. Before 1975, radioactive waste was disposed of down the drains of the sanitary waste collection system. The sanitary waste system is covered under PRS 43-001(a2) in Subsection 5.1.1.1 and PRS 43-001(a1) in Subsections 6.1.1 and 6.2.1 of this work plan. According to Bud Whaley, the current group leader of LS-2, the disposal sequence was for the containers to be collected in TA-43-1. The containers were then periodically removed to TA-50 for treatment. More recently, the carboy containers were stored in B-140 of TA-43-1, and periodically the Health Physics Team would move them to locked vaults on the TA-43-1 dock before shipment to TA-50 (Martell 1993, 23-0056). The current SOP calls for laboratory personnel to take the radioactive liquid waste directly from the laboratory to the vault while accompanied by the Health Physics Team (Strniste 1992, 23-0041). The vaults are designed to fully contain accidental releases. There are no known releases from this storage system (Figure 6-1).

6.2.4.2 Recommendation

PRS 43-005 is recommended for NFA and removal from the SWMU Report because no hazardous waste or constituents were managed at the unit and there is no evidence of a release. Hence, category 1 applies for recommending NFA.

6.2.4.3 Rationale for Recommendation

The laboratory locations associated with PRS 43-005 are within TA-43-1, and no documentation has been found that would indicate that any releases have ever occurred or that any risk is associated with this PRS.

REFERENCES

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

LANL (Los Alamos National Laboratory),September 1992. "Large Area Swipe Survey Report,"Los Alamos National Laboratory report prepared by R. Morgan and G. Padilla, Los Alamos, New Mexico. (LANL 1992, 23-0058)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. (LANL 1990, 0145)

Martell, C., January 19, 1993. "Interview with Tom 'Bud' Whaley about SWMU 43-005, the Radioactive Liquid Storage," Los Alamos National Laboratory Memorandum CLS-ER/CJM 93-006 to File from C. Martell (CLS-1), Los Alamos, New Mexico. (Martell 1993, 23-0056)

Mitchell, R.N., April 20, 1967. "Incinerator, Health Research Laboratory Bldg. TA-43," Los Alamos Scientific Laboratory Memorandum H-5 to H.F. Schulte (HS-5) from R.N. Mitchell (HS-5), Los Alamos, New Mexico. (Mitchell 1967, 23-0046)

Phillips, J.R., March 15, 1993. "Final Chemical Analysis and Certification," Los Alamos National Laboratory Memorandum to C. Martell (CLS-1) from J.R. Phillips (CLS-1), Los Alamos, New Mexico. (Phillips 1993, 23-0066)

Strniste, G.F., (reviewed June 30, 1992). "Safe Operating Procedure for the Receipt and Handling of Radioactive Materials and the Temporary Storage and Disposal of Low-Level Radioactive Wastes at the Health Research Laboratory, Los Alamos, New Mexico," Los Alamos National Laboratory report, Los Alamos, New Mexico. (Strniste 1992, 23-0041)

Watanabe, S., January 15, 1993. "Interview with Julie Wilson (LS-1) 1/15/1993, Concerning SWMU 43-003 Photo Processor and 43-002 Incinerator," Los Alamos National Laboratory Memorandum CLS-ER SW93-001 to File from S. Watanabe (Ewing Technical Design), Los Alamos , New Mexico. (Watanabe 1993, 23-0039)

Watanabe, S., January 27, 1993. "Interview with Ernesto Vigil Concerning the Incinerator," Los Alamos National Laboratory Memorandum CLS-ER SW93-012 to File from S. Watanabe (Ewing Technical Design), Los Alamos, New Mexico. (Watanabe 1993, 23-0083)

Watanabe, S., February 4, 1993. "Interview with Carolyn Stafford Concerning Satellite Storage Areas at the Health Research Laboratory," Los Alamos National Laboratory Memorandum CLS-ER SW93-003 to File from S. Watanabe (Ewing Technical Design), Los Alamos, New Mexico. (Watanabe 1993, 23-0057)

Watanabe, S., September 7, 1993. "Building TA-43-24, SWMU 43-001(b)," Los Alamos National Laboratory Memorandum CLS-ER SW93-006 to File from S. Watanabe (Ewing Technical Design), Los Alamos, New Mexico. (Watanabe 1993, 23-0074)

Watanabe, S., September, 9, 1993. "Incinerator Summaries: 43-002," Los Alamos National Laboratory Memorandum CLS-ER SW93-008 to File from S. Watanabe (Ewing Technical Design), Los Alamos, New Mexico. (Watanabe 1993, 23-0076)

Wilson, J., May 19, 1992. "Standard Operating Procedure for Disposal of Radiographic Fixer and Developer," Los Alamos National Laboratory report, Los Alamos, New Mexico. (Wilson 1992, 23-0043)

Annex I

Project Management Plan

1.0 PROJECT MANAGEMENT PLAN

This annex presents the technical approach, organizational structure, schedule, budget, and reporting milestones for implementation of the Operable Unit (OU) 1136 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) work plan. This plan is an extension of the Environmental Restoration (ER) Program Management Plan in Annex I of the Installation Work Plan (IWP) (LANL 1993, 1017). The OU 1136 RFI work plan does not contain any deviations from the IWP. This annex addresses the project management requirements of the Hazardous and Solid Waste Amendments (HSWA) Module (Task II, E., p. 39) of the Los Alamos National Laboratory's (the Laboratory's) RCRA Part B Permit (EPA 1990, 0306).

1.1 Technical Approach

The technical approach employed for the OU 1136 RFI work plan is described in Chapter 4. This approach is based on the ER Program's overall technical approach to the RCRA facility investigation/corrective measures study (CMS) process described in Chapter 3 of the IWP (LANL 1993, 1017). The following key features characterize the ER Program approach:

- use of screening action levels as criteria to support decisions to propose no further action (NFA), propose further characterization, or to trigger voluntary corrective actions (VCAs);
- further characterization, when necessary, using risk assessment to determine the need to perform a CMS or a VCA;
- sampling and analysis approach to site characterization;
- decision analysis and cost effectiveness through the data quality objective process to support the selection of remedial alternatives;
- application of the observational approach to the RFI/CMS process as a general philosophical framework; and

- integration of Resource Conservation and Recovery Act, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), National Environmental Policy Act, Atomic Energy Act, and other applicable regulations.

The general approach is to define the nature and extent of contamination at OU 1136 through a planned, phased investigation, data interpretation, and decision analysis. An objective is to support VCA or a CMS using the minimum data necessary.

The technical objectives of the phased RFI are to

- identify contaminants present at each potential release site (PRS) and, if none are present, proceed to NFA;
- determine the vertical and lateral extent of the contamination at each PRS;
- identify contaminant migration pathways;
- acquire sufficient information to allow quantitative migration pathway and risk assessment, as necessary;
- provide necessary data for the assessment of potential remedial alternatives, including VCAs;
- provide the basis for planning detailed CMSs; and
- use RCRA Subpart S regulation's conditional remedy concept to adopt an approach of stabilization in-place for material disposal areas (MDAs) as appropriate.

1.1.1 Implementation Rationale

Scheduling of investigations is based on the following rationale and priorities. Initial efforts are focused on obtaining OU-wide environmental data that form the basis for understanding contaminant transport processes. These investigations include

- geomorphic characterization of drainage channels to determine locations for representative sampling of mobile sediments, surface geophysics measurements to locate buried pipes, and radiation surveys to define areas contaminated by radioactive elements; and

- measurement of contaminant levels in surface soils as a basis for determining if levels of contaminants detected at individual PRSs are indicative of releases from individual PRSs or only represent the presence of the OU-wide contamination.

Generic investigations include surface sampling at individual PRSs, channel sediment sampling, sampling at subsurface structures such as septic tanks and sumps, near-surface sampling at buried outfalls and leach fields, and sampling of landfills and berms. Sites with unique problems, such as MDAs, are addressed separately.

1.2 Schedule

The schedule for the RFI process at OU 1136 is provided in Table I-1.Where possible, fieldwork has not been scheduled between November 15 and March 15 each year, to allow for inclement weather.

TABLE I-1

PROJECTED SCHEDULE FOR CORRECTIVE ACTION PROCESS, OPERABLE UNIT 1136

MILESTONE	DATE
Submit work plan	05/20/94
Start RFI	11/03/94
Start RFI report	11/01/95
Complete RFI fieldwork	10/31/95
Complete draft RFI report	12/05/96
Complete RFI	03/19/97
Complete assessment	03/19/97

1.3 Reporting

Results of RFI fieldwork will be presented in four principal documents: quarterly technical progress reports, RFI phase reports/work plan modifications, the RFI report, and the CMS report, if required. The purpose of each of these reports is detailed below. A schedule for submission of draft and final reports is presented in Table I-2.

TABLE I-2

REPORTS PLANNED FOR OPERABLE UNIT 1136 RFI

REPORT TYPE	EPA	DOE	DATE DUE
Monthly reports	X	X	25th of the following month
Quarterly report	X	X	March 31, yearly
Quarterly report	X	X	June 30, yearly
Quarterly report	X	X	September 30, yearly
Quarterly report	X	X	December 31, yearly
Phase reports			10/31/95
Draft RFI work plan	X	X	05/19/94
Draft Phase I report	X	X	07/09/96
Draft RFI report	X	X	12/05/96

1.3.1 Quarterly Technical Progress Reports

As the OU 1136 RFI is implemented, technical progress will be summarized in quarterly technical progress reports, as required by the HSWA Module of the Laboratory's RCRA Part B operating permit (Task V, C, p. 46). Detailed technical assessments will be provided in RFI phase report/work plan modifications.

1.3.2 RFI Phase Report/Work Plan Modifications

RFI phase reports/work plan modifications will be submitted for work conducted on PRSs. These phase reports will serve as partial RFI Phase I reports summarizing the results of initial site characterization activities and as partial RFI Phase II work plans describing the follow-on activities being planned if applicable (including any modifications to field sampling plans suggested by initial findings).

1.3.3 RFI Report

The RFI report will summarize all fieldwork conducted during the RFI. As required by the HSWA Module of the Laboratory's RCRA Part B operating permit (Task V, D, p. 46), the Laboratory will submit an RFI report within 60 days of completion of the RFI. As stated in the IWP, Subsection 3.5.1.2 (LANL 1993, 1017), the RFI report will describe the procedures, methods, and results of field investigations and will include information on the type and extent of contamination, sources and migration pathways, and actual and potential receptors. The report will also contain adequate information to support justification for no further action and corrective action decisions for PRSs.

1.3.4 CMS Report

The CMS report will propose methods of remediation for selected PRSs listed in the RFI report. Not all PRSs will need remediation because some will have been delisted based on recommendations made in the RFI report. If needed, the CMS report will describe the proposed remediation methods, procedures, and expected results, along with a plan, schedule, and cost estimate.

1.4 Budget

The schedule presented above is based on fixed budgets for the first two years of the RFI. The fixed budgets in fiscal years 1993 and 1994 (FY93 and FY94) are based on expected US Department of Energy (DOE) funding levels. DOE funding requests are set two years in advance; thus, the first year in which the RFI is not constrained by past budget estimates will be FY95. Funding requests for FY95 and beyond will reflect the cost and schedule that most efficiently complete the RFI plans. Table ES-1 in the Executive Summary presents a cost estimate for the OU 1136 RFI. Schedules and costs will be updated through DOE change control procedures with revisions submitted to the EPA for approval.

1.5 Organization

The organizational structure for the ER Program is presented in Section 3.0 and Annex I of the IWP. Organization of the ER Program is presented in Figure 3-1 of the IWP (LANL 1993, 1017).

This section details the management organization for the OU 1136 RFI. A list of contributors to the OU 1136 RFI Work Plan is in Appendix C.

The following are the responsibilities of the program manager, programmatic project leader, technical team, field team leaders, and field teams.

Program Manager

- ensures that the Laboratory's ER activities are consistent with the goals and objectives of the Environmental Management's Program Director, DOE, US Environmental Protection Agency (EPA), New Mexico Environment Department (NMED), and others, as appropriate;
- ensures compliance with the HSWA Module;
- ensures compliance with change control procedures;
- evaluates costs, schedules, and performance;
- submits monthly and quarterly reports to DOE, EPA, and NMED;
- tracks deliverables and milestones established by DOE, EPA, and NMED;
- ensures the establishment and implementation of the quality, health and safety, records management, and community relations programs; and
- ensures that policies, guidance, and relevant information are communicated to ER personnel by
    - periodically conducting meetings,
    - distributing essential guidance memoranda and letters, using a receipt acknowledgment system when necessary,
    - ensuring the preparation and controlled distribution of administrative procedures, and
    - establishing a standard routing system for routine guidance.

Programmatic Project Leader

The programmatic project leader provides technical and administrative programmatic guidance to operable unit project leaders (OUPLs) and technical team leaders (TTLs), including the following:

- meeting regulatory compliance requirements (especially RCRA and CERCLA), RFI/CMS/corrective measures implementation, document content, administrative and technical standard operating procedures, quality assurance and health and safety requirements, and general policies and requirements for doing business in the Laboratory's ER Program;
- defining allocation of resources to Laboratory and contractor personnel to accomplish required technical and management activities, and tracking progress and fiscal spending;
- assisting OUPLs and TTLs in obtaining appropriate and sufficient resources to perform their assigned duties;
- performing technical and policy reviews of documents prepared for the ER Program by OUPLs, TTLs, and affiliated staff;
- reviewing and recommending management action for scopes of work, proposals, or requests for work to be supported by the ER Program;
- reviewing progress of OUPLs and TTLs;
- recommending to management, corrective or enhancement actions to expeditiously meet ER Program goals;
- working closely with other programmatic project leaders and group leaders to ensure proper integration of program activities and fiscal responsibility, and to ensure compliance with applicable federal and state regulations;

- interacting with federal and state regulatory agencies; and
- providing input to monthly, quarterly, and/or annual progress reports, as required.

OU 1136 Project Leader

- oversees day-to-day operations, including planning, scheduling, and reporting technical and related administrative activities;
- ensures preparation of scientific investigation planning documents and procedures;
- prepares monthly and quarterly reports for the project manager;
- oversees subcontractors, as appropriate;
- coordinates with technical team leaders;
- conducts technical reviews of the milestones and final reports;
- interfaces with the ER quality program project leader to resolve quality concerns and to coordinate with the quality assurance (QA) staff for audits;
- complies with the ER Program health and safety, records management, and community relations requirements;
- oversees RFI fieldwork and manages the field teams manager; and
- complies with the Laboratory's technical and QA requirements for the ER Program.

Technical Team Members

Technical team members are responsible for providing technical input for their discipline throughout the RFI/CMS process. They have participated in the development of this work plan and the individual field sampling plans and will participate in the fieldwork, data analysis, report preparation, work plan modifications, and planning of subsequent investigations as necessary.

The primary disciplines currently represented on the technical team are hydrogeology, statistics, geochemistry, and health physics. The composition of the technical team may change with time as the technical expertise needed to implement the RFI changes.

Field Teams Manager

- oversees day-to-day field operations;
- conducts planning and scheduling for the implementation of the RFI field activities detailed in Chapters 4 and 5; and
- manages field team members.

Field Team Leader

The field teams manager will assign fieldwork to field team leaders for implementation. Each field team leader will direct the execution of field sampling activities using crews of field team members appropriate for the activity. Field team leaders may be contractor personnel.

Field Team Member(s)

Field team members may include

- sampling personnel,
- site safety officer,
- geologists,
- hydrologists,
- health physicists, and
- representatives from other applicable disciplines.

All teams will have, at a minimum, a site safety officer and a qualified field sampler. They are responsible for conducting the work detailed in field sampling plans under the direction of the field team leader. Field team members may be contractor personnel.

REFERENCES

EPA (US Environmental Protection Agency), April 10, 1990. Module VIII of RCRA Permit No. NM0890010515, EPA Region 6, issued to Los Alamos National Laboratory, Los Alamos, New Mexico, effective May 23, 1990, EPA Region 6, Hazardous Waste Management Division, Dallas, Texas. (EPA 1990, 0306)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

Annex II

Quality Assurance Project Plan

1.0 APPROVAL FOR IMPLEMENTATION

1. NAME: Jorg Jansen
   TITLE: ER Program Manager, Los Alamos National Laboratory

   SIGNATURE: ________________________ DATE: ______________

2. NAME: Larry Souza
   TITLE: Quality Program Project Leader, ER Program, Los Alamos National Laboratory

   SIGNATURE: ________________________ DATE: ______________

3. NAME: Barbara Driscoll
   TITLE: Geologist, Region 6, Environmental Protection Agency

   SIGNATURE: ________________________ DATE: ______________

4. NAME: Alva Smith
   TITLE: Chief of Office of Quality Assurance, Region 6, Environmental Protection Agency

   SIGNATURE: ________________________ DATE: ______________

5. NAME: David Bradbury
   TITLE: Operable Unit Project Leader, EM/ER, Los Alamos National Laboratory

   SIGNATURE: ________________________ DATE: ______________

Distribution of Official Copies

A list of the recipients of the official copies of this plan and any subsequent revisions will be developed and maintained as a document control activity.

2.0 INTRODUCTION

This Quality Assurance Project Plan (QAPjP) for the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan for Operable Unit (OU) 1136 was written as a matrix report that is based on the Los Alamos National Laboratory (the Laboratory) Environmental Restoration (ER) Program generic QAPjP. (LANL 1991, 0412).

The Laboratory ER Program generic QAPjP describes the format for the individual OU QAPjPs. In the generic QAPjP, Section 1.0 is the Approval For Implementation, which is included at the front of this annex. Section 2.0 of the generic QAPjP is the table of contents, which was omitted from this annex because the OU 1136 QAPjP is presented as a matrix. Section 3.0 of the generic QAPjP is the Project Description, and Subsection 3.1 is the Introduction. This introduction will serve as the equivalent of Subsection 3.1, and the matrix (Table II-1) will begin with Subsection 3.2, Facility Description.

While following the format of the generic QAPjP, this site-specific QAPjP has been designed to allow flexibility for meeting site-specific needs and to facilitate a cost-effective sampling and analysis plan focused on site-specific problems. In addition to following the format of the generic QAPjP, this site-specific QAPjP follows guidance from the soon-to-be-released US Environmental Protection Agency (EPA) QA/R-5 document "EPA requirements for Quality Assurance Project Plans for Environmental Data Operations."

The OU 1136 QAPjP matrix (Table II-1) lists the generic QAPjP criteria in the first column; these criteria correspond to the sections of the generic QAPjP. The second column lists the specific requirements of the generic QAPjP that the OU 1136 QAPjP must meet; the subsection titles and numbers in the second column correspond directly with those contained in generic QAPjP. Sections of the generic QAPjP that do not contain specific requirements are not included in the matrix, e.g., 3.4. The third column lists the location in the Installation Work Plan (IWP) (LANL 1993, 1017) and/or the OU 1136 work plan of information that fulfills the requirements in the generic QAPjP. If OU 1136 will follow the requirements in the generic QAPjP and no further information is necessary, the column contains the phrase "generic QAPjP accepted." In some cases, a standard operating

TABLE II-1

OU 1136 QAPjP MATRIX

GENERIC QAPjP CRITERIA	GENERIC QAPjP[1] REQUIREMENTS BY SUBSECTION	OU 1136 INCORPORATION OF GENERIC QAPjP REQUIREMENTS
Project description	3.2 Facility Description	Los Alamos National Laboratory (LANL) ER Program IWP[2], Section 2.0, and OU 1136 Work Plan, Chapter 2
	3.3 ER Program	LANL ER Program IWP, Section 3.0
	3.4.1 Project Objectives	OU 1136 Work Plan, Chapters 1 and 5
	3.4.2 Project Schedule	OU 1136 Work Plan, Annex I
	3.4.3 Project Scope	OU 1136 Work Plan, Chapters 1 and 5
	3.4.4 Background Information	OU 1136 Work Plan, Chapters 1, 2, and 3
	3.4.5 Data Management	OU 1136 Work Plan, Annex IV, and LANL ER Program IWP, Annex IV
Project organization	4.1 Line Authority	OU 1136 Work Plan, Annex I
	4.2 Personnel Qualifications, Training, Resumes	Maintained as records within OU 1136 record system
	4.3 Organizational Structure	LANL-ER-QPP[3], Section 2.0. See also *Note 1.*
Quality assurance objectives for measurement data in terms of precision,	5.1 Level of Quality Control	Generic QAPjP accepted
	5.2 Precision, Bias, and Sensitivity of Analyses	*Exception 1*
	5.3 QA Objectives for Precision	Generic QAPjP accepted
accuracy, representativeness, completeness, and	5.4 QA Objectives for Bias	*Exception 1*
	5.5 Representativeness, Completeness, and Comparability	*Notes 3 & 4*
comparability	5.6 Field Measurements	Generic QAPjP accepted
	5.7 Data Quality Objectives	OU 1136 Work Plan, Chapter 5
Sampling procedures	6.0 Sampling Procedures	OU 1136 Work Plan, Appendix D
	6.1 Quality Control Samples	Generic QAPjP accepted including ER Program SOP-01.05. See also *Note 2.*
	6.2 Sample Preservation During Shipment	Generic QAPjP accepted including ER Program SOP-01.02
	6.3 Equipment Decontamination	Generic QAPjP accepted including ER Program SOP-01.08
	6.4 Sample Designation	Generic QAPjP accepted including ER Program SOP-01.04
Sample custody	7.1 Overview	Generic QAPjP accepted including ER Program SOP-01.04
	7.2 Field Documentation	Generic QAPjP accepted including ER Program SOP-01.04
	7.3 Sample Management Facility	Generic QAPjP accepted
	7.4 Laboratory Documentation	Generic QAPjP accepted
	7.5 Sample Handling, Packaging, and Shipping	Generic QAPjP accepted including ER Program SOP-01.03
	7.6 Final Evidence File Documentation	Generic QAPjP accepted
Calibrations procedures and frequency	8.1 Overview	Generic QAPjP accepted
	8.2 Field Equipment	Generic QAPjP accepted
	8.3 Laboratory Equipment	*Exception 2*

TABLE II-1 (continued)

OU 1136 QAPjP MATRIX

GENERIC QAPjP CRITERIA	GENERIC QAPjP[1] REQUIREMENTS BY SUBSECTION	OU 1136 INCORPORATION OF GENERIC QAPjP REQUIREMENTS
Analytical procedures[4]	9.1 Overview	Generic QAPjP accepted
	9.2 Field Testing and Screening	Generic QAPjP accepted including ER Program SOP-06.02
	9.3 Laboratory Methods	*Exception 3.* Specific methods are described in OU 1136 RFI Work Plan, Appendix D
Data reduction, validation, and reporting	10.1 Data Reduction	Generic QAPjP accepted
	10.2 Data Validation	*Exception 4*
	10.3 Data Reporting	Generic QAPjP accepted
Internal quality-controlled checks	11.1 Field Sampling Quality Control Checks	Generic QAPjP accepted
	11.2 Laboratory Analytical Activities	Generic QAPjP accepted
Performance and system audits	12.0 Performance and System Audits	*Exception 5*
Preventive maintenance	13.1 Field Equipment	Generic QAPjP accepted
	13.2 Laboratory Equipment	Generic QAPjP accepted
Specific routine procedures used to assess data precision,	14.1 Precision	Generic QAPjP accepted
	14.2 Accuracy	Generic QAPjP accepted
	14.3 Sample Representativeness	Generic QAPjP accepted. See also *Note 3.*
accuracy, representativeness, and completeness	14.4 Completeness	Generic QAPjP accepted
Corrective action	15.1 Overview	Generic QAPjP accepted including LANL-ER-QP-01.3Q
	15.2 Field Corrective Action	Generic QAPjP accepted
	15.3 Laboratory Corrective Action	Generic QAPjP accepted
Quality assurance reports to management	16.1 Field Quality Assurance Reports to Management	Generic QAPjP accepted. See also *Note 4.*
	16.2 Laboratory Quality Assurance Reports to Management	Generic QAPjP accepted
	16.3 Internal Management Quality Assurance Reports	Generic QAPjP accepted

1 LANL 1991, 0412
2 LANL 1993, 1017
3 LANL 1991, 0840
4 Although the generic QAPjP criteria are accepted, special sampling limits, parameters, and analyses will be established for operable unit-specific cases. See the note at the top of page 9-2, Generic QA Project Plan (LANL 1991, 0412).

procedure (SOP) or a clarification note is included. Exceptions to the use of the generic QAPjP, which are based on the more recent EPA guidance, are listed below and are referenced in the appropriate lines of Table II-1.

***Exception 1:* Quality Assurance Objectives for Measurement Data in terms of Precision, Bias, Representativeness, Completeness, and Comparability**

Precision and bias constraints are derived through use of the data quality objective (DQO) process. The selected chemical analytical methods must be able to achieve the DQO requirements for measurement precision and bias so that the decision can be fully supported by the data. A further component related to quality assurance objectives is sensitivity. The methods selected must be sufficiently sensitive so that measurements close to the screening action levels (SALs) can be recorded. The estimated quantitation levels should be at least an order of magnitude lower than SALs.

***Exception 2*: Calibration Procedures and Frequencies**

Calibration procedures will be performed according to the analytical services selected. For fixed-laboratory analyses, the Environmental Chemistry Group (CST-9) subcontracts for analytical services, which are based on SW-846/CLP methods, contain the appropriate procedures.

***Exception 3*: Analytical Procedures**

Analytical procedures will be performed according to the analytical services selected. For fixed-laboratory analyses, the CST-9 subcontracts for organics, inorganics, HE, and radiochemistry analytical services, which are based on SW-846/CLP/USATHAMA methods (except for radionuclides, which are based on LANL/CST-9 Administrative Procedures), contain the appropriate procedures.

***Exception 4*: Data Reduction, Validation, and Reporting**

Data validation for fixed-laboratory analyses will focus on the area of concern; that is, the contaminants of concern and the concentration levels for which the SALs and the detection levels are close. The objective is to try to avoid false positive and false negative errors around the decision cut point of the SAL for a given potential contaminant of concern. However, limited data validation must also be performed further from the cut point because decision errors at high or low reported concentrations are potentially more damaging than decision errors around the cut point. The data validation program should be focused to produce information that can be used most cost effectively to support decision-making.

Note 1: **Section 4.0 Project Organization and Responsibility**

The organizational structure of the ER Program is presented in Section 2.0 of the Laboratory ER Quality Program Plan to the project leader level, including quality assurance (QA) functions (LANL 1991, 0840). The OU 1136 work plan, Annex I, describes the organizational structure from the project leader level down.*Note 2:* Section 6.1 Quality Control Samples

If soil samples for geotechnical analyses are collected during the OU 1136 RFI, then the following QA procedures will be used. In contrast to samples submitted for chemical analyses, field quality control samples are not routinely associated with geotechnical samples. Quality control (QC) for*Exception 5*: Internal Quality Control Checks

Internal quality control checks will be performed according to the analytical services selected. For fixed-laboratory analyses, the CST-9 subcontracts for organics, inorganics, HE, and radiochemistry analytical services, which are based on SW-846/CLP/USATHAMA methods (except for radionuclides, which are based on LANL/CST-9 Administrative Procedures), contain the appropriate procedures. However, duplicates and matrix spikes for organics will not be performed (more appropriate information is provided by the use of surrogates). Surrogates are also recommended for HE. For inorganics and radionuclides, duplicates and matrix spikes are required.

Note 2: **Section 6.1 Quality Control Samples**

If soil samples for geotechnical analyses are collected during the OU 1136 RFI, then the following QA procedures will be used. In contrast to samples submitted for chemical analyses, field quality control samples are not routinely associated with geotechnical samples. Quality control (QC) for geotechnical sample-analysis results is prescribed in the specific laboratory procedure. An additional measure of QC for geotechnical samples is achieved by the collection and submittal of a larger-than-sufficient volume of sample. A large sample volume may provide for reanalysis of an individual sample in the event that results from the initial aliquot did not meet specific method requirements.

QA and QC sampling for RFI Phase I in OU 1136 will provide samples to address variability in the sampling and analytical procedures. Most of these will be prescribed generically as follows:

- Rinsate samples (in general, one per day) will be collected if on-site decontamination of sampling equipment is being performed.
- A trip blank (one per sample delivery group) will be included whenever volatile organic compounds are a potential contaminant at the site.
- Field reagent blanks will be submitted only if reagents are brought in bulk to the site and measured out on site.
- The Sample Coordination Facility (SCF) will add blanks, surrogate spikes, and other QA samples to each batch following its standard practices. (Batch sizes will be determined by the SCF and will vary depending on the type of analyses to be performed. The SCF will attempt to keep samples from a sample delivery group together as much as possible when batching samples for the analytical laboratories.)
- The analytical laboratories will report analyses of instrument blanks, calibration standards, and other QC samples as specified in their contracts with the SCF.
- Field instrument calibration checks will be performed as specified in the SOPs controlling the use of those instruments. The results will be recorded in the field documentation.
- The field laboratories will provide laboratory splits, replicate analyses, and calibration checks as specified by their SOPs or QC programs. The results will be documented and reported to the field team leader.

In general, the QA/QC samples listed above are at most single blind samples.

The only types of QA sampling that are described in site-specific detail in Chapter 5 and Appendix D are matrix-matched performance evaluation (PE) samples to be inserted in the field for both field and off-site laboratories.

These are defined as follows:

- A PE sample is a matrix-matched sample inserted in the field with the purpose of evaluating any bias associated with the measurement process. PE samples are prepared and analyzed extensively ahead of time, using the same methods that are to be used for the field samples. This provides an appropriate mechanism for comparing "known" concentration values to values recorded through the current measurement process.

PE samples are used to estimate bias that may be associated with the measurement process. When PE samples are introduced in the field (blind to the laboratory), bias associated with transport, handling, and chemical analysis can be captured. PE samples also allow an estimation of components of measurement variation because the variability in the reported concentrations compared to the "known" concentrations can also be estimated.

Note 3: Section 14.3 Sample Representativeness

The field sampling plans presented in the OU 1136 work plan, Chapter 5, were developed to meet the sample representativeness criteria described in Subsection 14.3 of the Laboratory ER Program generic QAPjP (LANL 1991, 0412).

Note 4: Section 16.1 Field Quality Assurance Reports to Management

The OU field teams leader or a designee will provide a monthly field progress report to the ER project leader. This report will consist of the information identified in Subsection 16.1 of the ER Program generic QAPjP (LANL 1991, 0412).

REFERENCES

LANL (Los Alamos National Laboratory), May 1991. "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program," Revision 0, Los Alamos National Laboratory report, Los Alamos, New Mexico. (LANL 1991, 0412)

LANL (Los Alamos National Laboratory), June 1991. "Los Alamos National Laboratory Quality Program Plan for Environmental Restoration Activities," Revision 0, Los Alamos National Laboratory Report LA-UR-91-1844, Los Alamos, New Mexico. (LANL 1991, 0840)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

Annex III

Health and Safety Project Plan

Executive Summary

Chapter 1
Introduction

Chapter 2
Background Information

Chapter 3
Environmental Setting

Chapter 4
Technical Approach

Chapter 5
Evaluation of Potential Release Sites

Chapter 6
PRSs Recommended for No Further Action or Deferred Action

Annexes

Appendices

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Operable Unit Health and Safety Plan (OUHSP) is to address potential safety and health hazards, describe techniques for their evaluation, and identify control methods. The goal is to eliminate injuries and illness; to minimize exposure to physical, chemical, biological, and radiological agents during environmental restoration (ER) activities; and to provide contingencies for events that may occur while these efforts are under way.

It is intended that project managers, health and safety professionals, Laboratory managers, and regulators use this OUHSP as a reference for information about health and safety programs and procedures as they relate to this operable unit (OU). Detailed site-specific health and safety plans (SSHSPs) and procedures will be prepared subsequent to this document for each field activity planned, whether it is specific to a single potential release site (PRS) or a group of PRSs being investigated simultaneously.

The Environment, Safety, and Health (ESH) Division Hazardous Waste Operations Program establishes Laboratory policies for health and safety activities at ER sites. The hierarchy of health and safety documents for the Los Alamos National Laboratory (the Laboratory) ER Program is as follows:

- Installation Work Plan, Health and Safety Program Plan (IWPHSPP) (LANL 1993, 1017)
- Operable unit health and safety plan
- Site-specific health and safety plan

The first document is more general, whereas the others become increasingly more specific and detailed. The contents and references to these and other documents should always be considered when making decisions.

1.2 Applicability

The requirements set out in this plan apply to all personnel at ER sites, including Laboratory employees, supplemental work force personnel, regulators, and visitors. There are no exceptions.

1.3 Regulatory Requirements

Government-owned, contractor-operated facilities must comply with Occupational Safety and Health Administration (OSHA) regulations, US Environmental Protection Agency (EPA) regulations, US Department of Energy (DOE) orders, and any specific requirements from the applicable state agencies. The SSHSP will include all applicable regulatory requirements.

1.4 Required Elements of the SSHSP

OSHA regulation 29 Code of Federal Regulations (CFR) 1910.120(b) (4) (ii) (OSHA 1991, 0610) requires that the specific site health and safety plan, at a minimum, address the following elements:

- A safety and health risk or hazard analysis for each site task and operation found in the work plan.
- Employee training appropriate for the tasks to be performed.
- Appropriate personal protective equipment to be used by employees for each task and operation being conducted.
- Medical surveillance requirements for site workers.
- Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.
- Site control measures to be used.
- Decontamination procedures to be used.
- The emergency response plan for safe and effective responses to emergencies.
- Confined space entry procedures, when applicable.
- A spill containment program.

2.0 ORGANIZATION, RESPONSIBILITY, AND AUTHORITY

2.1 General Responsibilities

The Laboratory's Environment, Safety, and Health Manual delineates managers' and employees' responsibilities for conducting safe operations and providing for the safety of contract personnel and visitors (LANL 1990, 0335). The general safety responsibilities for ER activities are summarized in the IWPHSPP (LANL 1993, 1017). Line management is responsible for implementing health and safety requirements.

Personnel conducting work for the ER Program will comply with the Laboratory's stop-work policy and the requirements of Laboratory Procedure (LP) 116-01.0. Forms and Documentation Logs of Stop Work Reports are included in LP 116-01.0 In addition, upon initiation of stop-work actions, ER Program personnel will notify the site safety officer (SSO), the ER Program health and safety project leader (HSPL), and the operable unit project leader (OUPL).

2.1.1 Kick-Off Meeting

A health and safety kickoff meeting will be held before fieldwork begins. The purpose of the meeting is to reach a consensus on responsibility, authority, lines of communication, and scheduling. The HSPL will organize the meeting and has the authority to delay fieldwork until the kickoff meeting is held.

2.1.2 Readiness Review

A field readiness review must be completed by the OUPL before field activities begin. The HSPL is responsible for approving the health and safety section of the readiness review.

2.2 Individual Responsibilities

Laboratory employees and supplemental work force personnel are responsible for health and safety during ER Program activities. The personnel with direct authority for implementation of SSHSPs are the HSPL, the OUPL and the SSO (works as a field team member). The responsibilities of each person are specific to health and safety for OU 1136 as described in the following subsections.

2.2.1 Health and Safety Project Leader

The HSPL helps the OUPL identify resources to be used for the preparation and implementation of the OUHSP and the SSHSP. Final approval of the OUHSP and SSHSP is the responsibility of the HSPL. In conjunction with the field team leaders, the HSPL oversees daily health and safety activities in the field, including scheduling, tracking deliverables, and resource utilization.

2.2.2 Operable Unit Project Leader

The OUPL is responsible for all investigation activities for OU 1136. Specific health and safety responsibilities include

- preparing, reviewing, implementing, and revising the OUHSP and the SSHSP;
- interfacing with the HSPL to resolve health and safety concerns; and
- notifying the HSPL of schedule and project changes.

2.2.3 Site Safety Officer

An SSO other than the field team leader may be assigned depending on the potential hazards. Contractors must assign their own SSO.

The SSO is responsible for ensuring that trained and competent personnel are on site. This includes industrial hygiene and health physics technicians and first aid/cardiopulmonary resuscitation responders. The SSO may fill any or all of these roles.

The SSO has the following responsibilities:

- advising the HSPL and OUPL of health and safety issues;
- performing and documenting initial inspections for all site equipment;
- notifying proper Laboratory authorities of injuries or illnesses, emergencies, or stop-work orders;

- evaluating the analytical results for health and safety concerns;
- determining protective clothing requirements;
- determining personal dosimetry requirements for workers;
- maintaining a current list of telephone numbers for emergency situations;
- providing an operating radio transmitter/receiver if necessary;
- maintaining an up-to-date copy of the SSHSP for work at the site;
- establishing and enforcing the safety requirements to be followed by visitors;
- briefing visitors on health and safety issues;
- maintaining a logbook of workers entering the site;
- determining whether workers can perform their jobs safely under prevailing weather conditions;
- controlling emergency situations in collaboration with Laboratory personnel;
- ensuring that all personnel are trained in the appropriate safety procedures and are familiar with the SSHSP and that all requirements are followed during OU activities;
- conducting daily health and safety briefings for field team members;
- stopping work when unsafe conditions develop or an imminent hazard is perceived; and
- maintaining first aid supplies.

2.3 Visitors

Site access will be controlled so that only verified team members and previously approved visitors will be allowed in work areas or areas containing potentially hazardous materials or conditions. Special passes or badges may be issued. Any visitors who are on site to collect samples or split samples must meet all the health and safety requirements of any field sampling team for that site. Visitors present for purposes other than sample collection will not be permitted to enter the contaminated areas of site.

2.4 Supplemental Work Force

All supplemental work force personnel performing site investigations will be responsible for developing health and safety plans that cover their specific project assignments. At a minimum, the plans will conform to the requirements of the SSHSP governing all site activities. The HSPL has the ultimate authority to accept or reject SSHSPs prepared by supplemental work force personnel for specific project assignments.

Contractors will adhere to the requirements of all applicable health and safety plans. Laboratory personnel will monitor activities to ensure that this is done. Failure to adhere to these requirements can cause work to stop until compliance is achieved.

Contractors will provide their own health and safety functions unless other contractual agreements have been arranged. Such functions may include, but are not limited to, providing qualified health and safety officers for site work, imparting a corporate health and safety environment to their employees, providing calibrated industrial hygiene and radiological monitoring equipment, enrolling in an approved medical surveillance program, supplying approved respiratory and personal protective equipment (PPE), providing safe work practices, and training hazardous waste workers.

2.5 Personnel Qualifications

The HSPL will establish minimum training and competency requirements for on-site personnel. These requirements will meet or exceed 29 CFR 1910.120 regulations (OSHA 1991, 0610).

2.6 Health and Safety Oversight

Oversight will be maintained to ensure compliance with regulatory requirements. The ESH Division is responsible for developing and implementing the oversight program. The frequency of field verifications will depend on the characteristics of the site, the equipment used, and the scope of work.

3.0 SCOPE OF WORK

3.1 Comprehensive Work Plan

The IWPHSPP targets OU 1136 for investigation. The initial phase is investigation and characterization, involving environmental sampling and field assessment of the areas. This OUHSP addresses the tasks in the Phase I study. Tasks for additional phases will be addressed in revisions to this OUHSP or in future SSHSPs.

3.2 Operable Unit Description

Operable Unit 1136 consists of nine PRSs. These include three solid waste management units and six areas of concern. Thorough descriptions and histories of these sites can be found in Chapters 5 and 6. Table III-1 summarizes the PRSs, the potential chemical hazards, and the work planned at this time.

TABLE III-1

SUMMARY OF CHEMICAL HAZARDS ANTICIPATED DURING SITE WORK AT PRSs, OU 1136

DESCRIPTION	SUBSTANCE OF CONCERN	TASK(S)
Sanitary sewer lines and outfalls from research facilities	Radionuclides, metals, organic substances	Swipes, soil and sediment sampling

4.0 HAZARD IDENTIFICATION AND ASSESSMENT

The SSO or designee will monitor field conditions and personnel exposure to physical, chemical, biological, and radiological hazards. If a previously unidentified hazard is discovered, the SSO will contact the field team leader and the HSPL and assess the hazard. A hazard assessment will be performed to identify the potential harm, the likelihood of occurrence, and the measures to reduce risk.

4.1 Physical Hazards

Injuries caused by physical hazards are preventable. Some physical hazards such as open trenches, loud noise, and heavy lifting are easily recognized. Others, such as heat stress and sunburn, high altitude, rock slides, very irregular terrain, lightning, and other hazards prevalent at Los Alamos, are less apparent. Physical hazards will be addressed thoroughly in the SSHSP.

4.2 Chemical Hazards

A variety of chemical contaminants are known or are suspected to be present at OU 1136.

The SSHSP will provide information for known or suspected contaminants that will include

- American Conference of Governmental Industrial Hygienist's threshold limit values for concentrations immediately dangerous to life and health,
- exposure symptoms,
- ionization potential, and
- relative response factors for commonly used instruments (re-evaluated when the particular instrument is selected), and the best instrument for screening.

4.3 Radiological Hazards

A number of radionuclides are suspected to be present. The SSHSP will provide information for suspected radionuclides that will include the type of radiation emitted, the permissible exposure concentrations, and the monitoring instruments recommended for detection under field conditions.

4.4 Biological Hazards

There are several biological hazards found at Los Alamos that are not common in other parts of the country. These include, but are not limited to, rattlesnakes, wild animals, ticks, plague, *Giardia lamblia*, and black widow spiders. The SSHSP will provide specific instructions on appropriate actions relating to each of these hazards.

4.5 Task-by-Task Risk Analysis

A task-by-task risk analysis is required by 29 CFR 1910.120 and will be included with each SSHSP (OSHA 1991, 0610). This process analyzes the operations and activities for specific hazards by task. The major tasks that should be analyzed and documented in the SSHSP are

- drilling,
- hand augering,
- septic and chemical waste system sampling, and
- canyon-side sampling.

Other tasks should be considered for inclusion by the SSO.

The task analysis will include a general characterization of the health and safety concerns at an individual PRS or aggregate of PRSs and an evaluation of risks posed when performing individual tasks such as drilling, hand augering, etc. When chemical hazards are known, they will be identified in the SSHSP and categorized with regard to the relative degree of hazard posed to site workers. Physical hazards at each PRS or aggregate of PRSs included in the SSHSP will be identified and evaluated so that workers may take precautions against the often overlooked physical hazards at a site.

5.0 SITE CONTROL

5.1 Initial Site Reconnaissance

Initial site reconnaissance may involve surveyors, archaeologists, biological resource personnel, etc. Health and safety concerns that may be present must be addressed to protect personnel. The OUPL and HSPL will identify these concerns and institute measures to protect environmental impact assessment personnel.

5.2 Site-Specific Health and Safety Plans

Each field event within an OU requires an SSHSP. Planning, special training, supervision, protective measures, and oversight needs are different for each event, and the SSHSP addresses this variability. The SSHSP will address the safety and health hazards of each phase of site operations and include requirements and procedures for employee protection.

The standard outline for the SSHSP will follow OSHA requirements and will serve as a guide for best management practice. Those performing the fieldwork are responsible for completing the plan.

Changes to the SSHSP will be made in writing. The HSPL will approve changes, and site personnel will be updated through daily tailgate meetings. Records of SSHSP approvals and changes will be maintained by the SSO.

5.3 Work Zones

Maps identifying work zones will be included with each SSHSP. Markings used to designate each zone boundary (red or yellow tape, fences, barricades, etc.) will be discussed in the plan. Evacuation routes will be upwind or crosswind of the exclusion zone. A muster area will be designated for each evacuation route. Discrete zones are not required for every field event. The SSO will determine work zones.

5.4 Secured Areas

Secured areas will be identified and shown on the site maps. Procedures and responsibilities for maintaining secured areas will be described. Standard Laboratory security procedures will be followed for accessing secure areas. All contractors and visitors must be processed through the badge office before entering secure areas.

5.5 Communications Systems

Portable telephones, CB radios, and two-way radios may be used for most on-site communications.

5.6 General Safe Work Practices

Workers will be instructed on safe work practices to be followed when performing tasks and operating equipment needed to complete the project. Daily safety tailgate meetings will be conducted at the beginning of the shift to brief workers on proposed activities and special precautions to be taken. General safe work practices will be included in the SSHSP. Topics will include use of the buddy system; eating, drinking, smoking at the site; housekeeping at the site; contingency planning, worker conduct while on site and other practices that may be appropriate at the site.

5.7 Specific Safe Work Practices

5.7.1 Electrical Safety-Related Work Practices

The most effective way to avoid accidental contact with electricity is to de-energize the system or maintain a safe distance from the energized parts/ line. OSHA regulations require minimum distances from energized parts. An individual working near power lines must maintain at least a 10 ft clearance from overhead lines of 50 kilovolts (kV) or fewer. The clearance includes any conductive material the individual may be using. For voltages over 50 kV, the 10 ft clearance must be increased 4 in. for every 10 kV over 50 kV.

5.7.2 Grounding

Grounding is a secondary form of protection that ensures a path of low resistance to ground if there is an electrical equipment failure. A properly installed ground wire becomes the path for electrical current if the equipment malfunctions. Without proper grounding, an individual could become the path to ground if he/she touches the equipment. An assured electrical grounding program or ground fault circuit interrupter is required.

5.7.3 Lockout/Tagout

All site workers must follow a standard operating procedure for control of hazardous energy sources (Laboratory Administrative Requirement (AR) 8-6, LP 106-01.1). Lockout/tagout procedures are used to control hazardous energy sources, such as electricity, potential energy, thermal energy, chemical corrosivity, chemical toxicity, or hydraulic and pneumatic pressure.

5.7.4 Confined Space

Entry and work to be conducted in confined spaces will adhere to procedures proposed in the Laboratory Confined Space Entry Program. These procedures require that a Confined Space Entry Permit be obtained and posted at the work site. Prior to entry, the atmosphere will be tested for oxygen content, flammable vapors, carbon monoxide, and other hazardous gases. Continuous monitoring for these constituents will be performed if conditions or activities have the potential to adversely affect the atmosphere.

5.7.5 Handling Drums and Containers

Drums and containers used during the cleanup of a site will meet US Department of Transportation, OSHA, and EPA regulations. Work practices, labeling requirements, spill containment measures, and precautions for opening drums and containers will be in accordance with 29 CFR 1910.120 (OSHA 1991, 0610). Drums and containers that contain radioactive material must also be labeled in accordance with AR 3-5, Shipment of Radioactive Materials; AR 3-7; Radiation Exposure Control; and Article 412, Radioactive Material Laboratory, DOE Radiological Control Manual (DOE 1992, 23-0096). Provisions for these activities will be clearly outlined in the SSHSP, if applicable.

5.7.6 Illumination

Illumination will meet the requirements of Table H-120.1, 29 CFR 1910.120 (OSHA 1991, 0610).

5.7.7 Sanitation

An adequate supply of potable water will be provided at the site. Nonpotable water sources will be clearly marked as not suitable for drinking or washing.

At remote sites, at least one toilet facility will be provided, unless the crew is mobile and has transportation readily available to nearby toilet facilities.

5.7.8 Packaging and Transport

The OUPL will contact the Waste Management Group, CST-7, to determine requirements for storing and transporting hazardous waste to ensure that practices for storage, packaging, and transportation comply with ARs 10-2 and 10-3.

5.7.9 Government Vehicle Use

Only government vehicles can be driven onto contaminated sites. No personal vehicles are allowed.

5.7.10 Extended Work Schedules

Scheduled work outside normal work hours will have the prior approval of the OUPL and SSO.

5.8 Permits

The following permits may be required for field activities:

- Excavation Permits
- Radiation Work Permits
- Special Work Permit for Spark/Flame-producing Operations
- Confined Space Entry Permits
- Lockout/Tagout Permits

The SSO and OUPL are responsible for obtaining permits and maintaining documentation. Permits will be specifically addressed in the SSHSP.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 General Requirements

If engineering controls and work practices do not provide adequate protection against hazards, PPE may be required. For each operation included in the SSHSP, appropriate PPE will be designated. Use of PPE is required by OSHA regulations in 29 CFR Part 1910, Subpart I (OSHA 1991, 0610). Subcontractors are responsible for supplying PPE to their workers.

In addition, the use of PPE for radiological protection will be governed by the Radiation Work Permit (or Safety Work Permits/Radiation Work). AR 3-7 and Article 325, Article 461, Table 3.1, and Appendix 3C of the DOE Radiological Control Manual contain guidelines for the use of protective clothing during radiological operations (DOE 1992, 23-0096).

6.2 Protective Equipment

Protective equipment, including protective eye-wear and shoes, head gear, hearing protection, splash protection, lifelines, and safety harnesses, must meet American National Standards Institute standards.

6.3 Respiratory Protection Program

When engineering controls cannot maintain airborne contaminants at acceptable levels, appropriate respiratory protective measures will be used. The ESH Division administers the respiratory protection program, which defines respiratory protection requirements; verifies that personnel have met the criteria for training, medical surveillance, and fit testing; and, maintains the appropriate records.

All supplemental workers will submit documentation of participation in an acceptable respiratory protection program to the Industrial Hygiene and Safety Group (ESH-5) for review and signature approval before using respirators on site.

7.0 HAZARD CONTROLS

7.1 Engineering Controls

OSHA regulations state that when possible engineering controls should be used as the first line of defense for protecting workers from hazards. Engineering controls are mechanical means for reducing hazards to workers, such as guarding moving parts on machinery and tools or using ventilation during confined space entry. Specific engineering controls appropriate for site conditions will be described in the SSHSP.

7.2 Administrative Controls

Administrative controls are necessary when hazards are present and engineering controls are not feasible. Administrative controls are a method for controlling the degree of exposure (e.g., how long or how close to the hazard the worker remains). Worker rotation will not be used to achieve compliance with permissible exposure limits or dose limits. Specific administrative controls will be presented in the SSHSP.

8.0 SITE MONITORING

A monitoring program or plan that meets the requirements of 29 CFR 1910.120 will be implemented for each OU (OSHA 1991, 0610). Laboratory-approved sampling, analytical, and record keeping methods must be used. A detailed monitoring strategy will be incorporated into each SSHSP. The strategy will describe the frequency, duration, and type of samples to be collected.

8.1 Chemical Air Contaminants

DOE has adopted OSHA permissible exposure limits and the American Conference of Governmental Industrial Hygienists' threshold limit values as standards for defining acceptable levels of exposure. The more stringent of the two limits applies.

8.1.1 Measurement

Measurements of chemical contaminants can be performed using direct or indirect sampling methods. Direct methods provide near real-time results and are often used as screening tools to determine levels of PPE, the need for additional sampling, etc. Indirect sampling involves collecting a sample in the field and transporting it to a laboratory for analysis. It will be the responsibility of the SSO to determine the most appropriate sampling method for each situation. If there are any questions about sampling methodology, the SSO should consult with the HSPL or a certified industrial hygienist.

8.1.2 Personal Monitoring

The site history should be used to determine the need for monitoring for specific chemical agents. Initial air monitoring will be performed to characterize the exposure levels at the site and to determine the appropriate level of personal protection needed. Monitoring strategies will emphasize worst-case conditions if monitoring each individual is inappropriate.

8.1.3 Perimeter Monitoring

Perimeter monitoring will be performed to characterize airborne concentrations in adjoining areas. If results indicate that contaminants are moving off site, control measures must be re-evaluated. The perimeter is defined as the boundary of the OU site.

8.2 Radiological Hazards

When radiological hazards are known or suspected, workplace monitoring will be performed as necessary to ensure that exposures are within the requirements of DOE Order 5480.11 and are as low as reasonably achievable (ALARA) (DOE 1990, 0732). Workplace monitoring consists of monitoring for airborne radioactivity, external radiation fields, and surface contamination. The Laboratory's workplace monitoring program is described in AR 3-7, Radiation Exposure Control.

8.3 Other Hazards

Other hazards, such as noise hazards, will be monitored as appropriate. Monitoring for other hazards will be included in the SSHSP when those hazards are anticipated.

9.0 MEDICAL SURVEILLANCE AND MONITORING

9.1 General Requirements

A medical surveillance program will be instituted to assess and monitor the health and fitness of workers engaged in hazardous waste operations. Medical surveillance is required for personnel who are or may be exposed to hazardous substances at or above established permissible exposure limits for 30 days in a 12-month period, as detailed in 29 CFR 1910.120 (OSHA 1991, 0610). Medical surveillance is also required for personnel with duties that require the use of respirators or with symptoms indicating possible overexposure to hazardous substances.

Contractors are responsible for medical surveillance of their employees. The ESH Division will audit contractor programs.

9.2 Medical Surveillance Program

All field team members who participate in ER Program investigations must participate in a medical surveillance program. The program will conform to DOE Order 5480.10 (DOE 1985, 0062),29 CFR 1910.120 (OSHA 1991, 0610), AR 2-1, and any criteria established by the Occupational Medicine Group (ESH-2) at the Laboratory. The program will provide for initial medical evaluations to determine fitness for duty and subsequent medical surveillance of individuals engaged in hazardous waste operations.

9.3 Emergency Treatment

In the event of an on-the-job injury, ESH-2 will implement required reporting and recordkeeping procedures. The SSHSP describes the actions to be taken by the employee at the time of the injury/illness.

10.0 BIOASSAY PROGRAM

The OU site field characterization efforts will include intrusive investigations of areas of unknown but probable contamination potential. Given the uncertainties associated with this type of fieldwork, the project internal exposure monitoring program is based on the assumption that personnel will be exposed to radioactive and/or hazardous chemical contaminants. Accordingly, the bioassay program will be conducted in accordance with the provisions of the Policy and Program Analysis Group (ESH-12).

11.0 DECONTAMINATION

11.1 Introduction

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel and equipment and is critical to health and safety at hazardous waste sites. Decontamination protects workers from hazardous substances that may contaminate protective clothing, respiratory protection equipment, tools, vehicles, and other equipment used on site. It minimizes the transfer of harmful materials into clean areas, helps prevent mixing of incompatible chemicals, and prevents uncontrolled transportation of contaminants from the site into the community.

11.1.1 Decontamination Plan

The site decontamination plan is mandatory and will be part of the SSHSP. At a minimum, the plan will include the step-by-step decontamination procedure and diagrams showing how the decontamination station will be arranged.

The plan should be revised whenever the type of personal protective clothing or equipment changes, the site conditions change, or the site hazards are reassessed based on new information.

11.1.2 Facilities

Clean areas will be separate from contaminated areas and materials. The SSO will verify that decontamination facilities are maintained in acceptable condition and that supplies of decontaminating agents and other materials are available.

11.2 Personnel

The SSO is responsible for enforcing the decontamination plan. All personnel leaving the exclusion zone must be decontaminated to remove any chemical, radiological, or infectious agents that may have adhered to them.

11.2.1 Radiological Decontamination

Personnel exiting contamination areas, high contamination areas, airborne radioactivity areas, or radiological buffer areas established for contamination control will be frisked for contamination.

11.2.2 Chemical Decontamination

The decontamination of chemically contaminated personnel will be detailed in the site decontamination plan.

11.3 Equipment Decontamination

Prior to release from the site, tools and equipment contaminated with removable radioactive and chemical materials in excess of applicable limits will be manually decontaminated at the field location.

11.4 Waste Management

Fluids and materials resulting from decontamination processes will be contained, sampled, and analyzed for contaminants. Those materials determined to be contaminated in excess of appropriate limits are packaged in approved containers and disposed of in accordance with Environmental Restoration and Waste Management Programs procedures.

The Laboratory will be responsible for characterization and disposal of chemical wastes generated by its subcontractors during site work under the ER Program.

12.0 EMERGENCIES

Emergency response, as defined by 29 CFR 1910.120, will be handled by Laboratory personnel (OSHA 1991, 0610). ER contractors are responsible for developing and implementing their own emergency action plans as defined in 29 CFR 1910.38. All emergency action plans will be consistent with Laboratory emergency response plans and will include specific procedures for dealing with site emergencies in an efficient manner. The emergency response plans also must contain the following elements, as required by OSHA 29 CFR 1910.120 (e) (2) (OSHA 1991, 0610):

- pre-emergency planning including map of site to show layout;
- personnel roles, lines of authority, and communication;
- emergency recognition and prevention;
- safe distances and refuge;
- site security and control;
- evacuation routes and procedure;
- decontamination procedures not covered in the SSHSP;
- emergency medical treatment and first aid;
- emergency alerting and response procedures;

- critique of response and follow-up;
- PPE and emergency equipment; and
- procedures for reporting incidents to local, state, and federal governmental agencies, both for personnel injuries and property (including vehicle) damage.

The SSO, with assistance from the field team leader, will have the responsibility and authority for coordinating all emergency response activities until the proper authorities arrive and assume control.

When an emergency occurs at the Laboratory, the Laboratory emergency response organization is responsible for all elements of response throughout the duration of the emergency.

The Laboratory Emergency Response Plan is designed to be compatible with emergency plans developed by local, state, tribal, and federal agencies through establishment of communications channels with these agencies and by setting criteria for the notification of each agency.

12.1 Emergency Action Plan

An emergency action plan provides emergency information for contingencies that may arise during the course of field operations. It provides site personnel with instructions for the appropriate sequence of responses in the event of either site emergencies or off-site emergencies. The emergency action plan will be attached to the SSHSP.

12.2 Provisions for Public Health and Safety

Emergency planning for public health and safety is presented in the Laboratory's Environment, Safety, and Health Manual.

12.3 Notification Requirements

Field team members will notify the SSO of emergency situations. The SSO will notify the appropriate emergency assistance personnel (e.g., fire, police, and ambulance), the OUPL, the HSPL, the Laboratory Health and Safety Division according to DOE Order 5500.2B (DOE 1991, 0736), and DOE Albuquerque Operations Office (AL) Order 5000.3 (DOE/AL 1986, 0734). The Laboratory ESH Division is responsible for implementing notification and reporting requirements according to DOE Order 5484.1 (DOE 1990, 0733).

12.4 Documentation

An unusual occurrence is any deviation from the planned or expected behavior or course of events in connection with any DOE or DOE-controlled operation if the deviation has environment, safety, or health protection significance. All unusual occurrences must be reported and documented in accordance with Laboratory AR 1-1.

The HSPL will work with the OUPL and the field team leader to ensure that health and safety records are maintained with the appropriate Laboratory group, as required by DOE orders.

13.0 PERSONNEL TRAINING

13.1 General Employee Training and Site Orientation

All Laboratory employees and contractors must successfully complete Laboratory general employee training, or equivalent training.

Several types of additional training are required, including

- OSHA-mandated,
- facility-specific,
- site-specific or pre-entry, and
- daily safety briefings.

Site workers will receive each type of training during the course of field activities.

13.2 Site-Specific Training

Prior to granting site access, personnel must be given site-specific training. Attendance at and understanding of the site-specific training must be documented.

13.3 Radiation Safety Training

Basic radiation worker training is required for all site workers (1) whose job assignments involve operation of radiation-producing devices, (2) who work with radioactive materials, (3) who are likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year, or (4) who require unescorted entry into a radiological area.

Radiation protection training is required for all Laboratory employees, contractors, visiting scientists, and DOE and Department of Defense personnel who will be working on-site.

13.4 Hazard Communication

Laboratory employees will be trained in hazard communication in accordance with ESH Division requirements. Contractors will provide training to their employees in compliance with 29 CFR 1910.120 (OSHA 1991, 0610).

13.5 Facility-Specific Training

Certain areas of the Laboratory (e.g., firing sites) require additional facility specific training before personnel can enter.

13.6 Records

Records of training will be maintained by the ESH Division and in the project file to confirm that every individual assigned to a task has had adequate training for that task and that every employee's training is up to date. The SSO or his designee is responsible for ensuring that persons entering the site are properly trained.

REFERENCES

DOE (US Department of Energy), April 30, 1991. "Emergency Categories, Classes, and Notification and Reporting Requirements," DOE Order 5500.2B, Washington, DC. (DOE 1991, 0736)

DOE (US Department of Energy), June 26, 1985. "Contractor Industrial Hygiene Program," DOE Order 5480.10, Washington, DC. (DOE 1985, 0062)

DOE (US Department of Energy), June 29, 1990. "Radiation Protection for Occupational Workers," DOE Order 5480.11, Change 2, Washington, DC. (DOE 1990, 0732)

DOE (US Department of Energy), June 1992. "Radiological Control Manual," DOE/EH-0256T, Washington, DC. (DOE 1992, 23-0096)

DOE (US Department of Energy), October 17, 1980. "Environmental Protection, Safety, and Health Protection Information Reporting Requirements," DOE Order 5484.1, Change 7, Washington, DC. (DOE 1990, 0733)

DOE/AL (US Department of Energy, Albuquerque Operations Office), October 24, 1986. "Unusual Occurrence Reporting System," DOE/AL Order 5000.3, Albuquerque, New Mexico. (DOE/AL 1986, 0734)

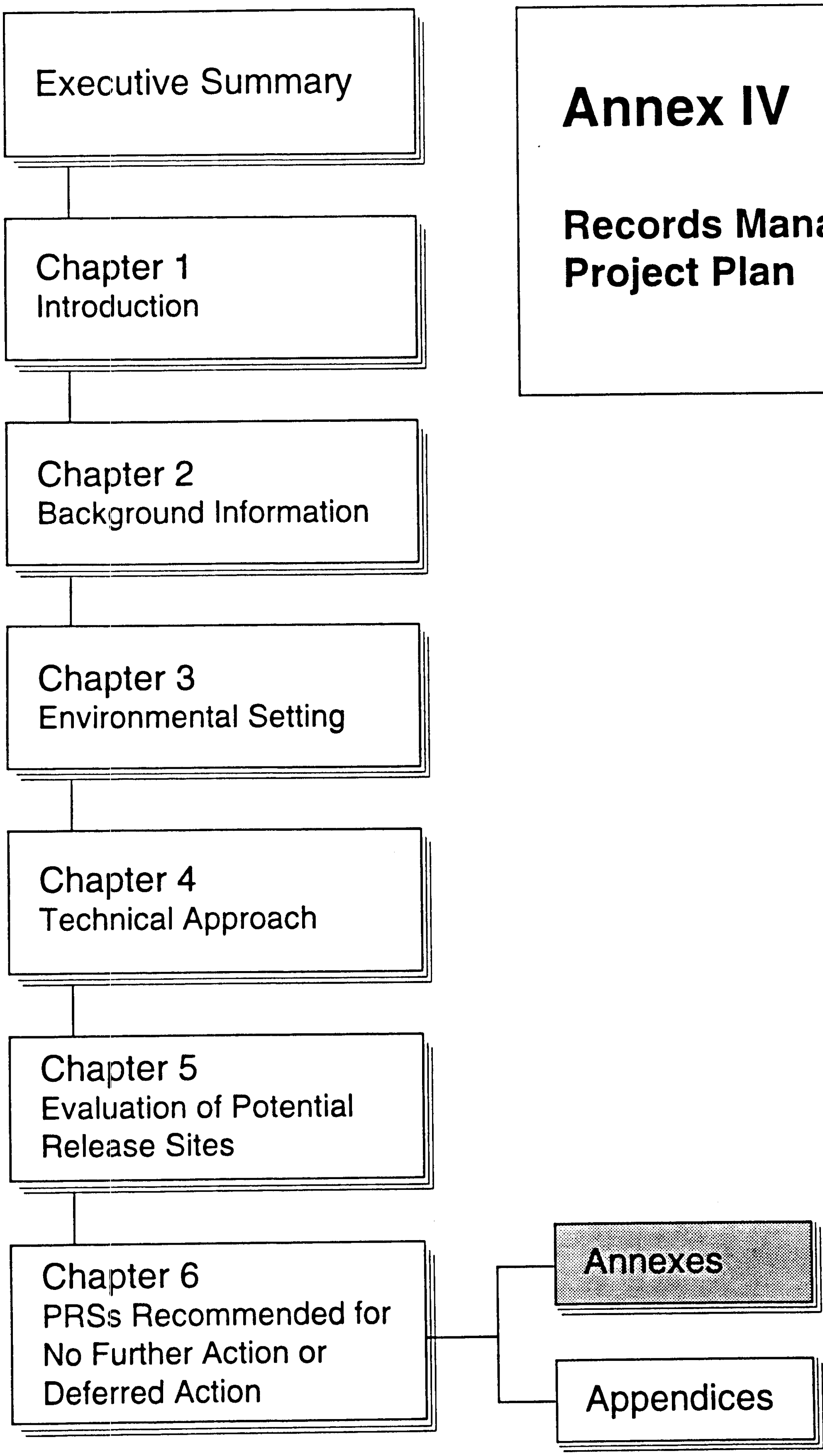
LANL (Los Alamos National Laboratory), June 1, 1990. "Environment, Safety, and Health Manual," AR 10-3, Chemical, Hazardous and Mixed Waste, Los Alamos, New Mexico. (LANL 1990, 0335)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

OSHA (Occupational Safety and Health Administration), July 1, 1991. "Hazardous Waste Operations and Emergency Response," Code of Federal Regulations, Title 29, Part 1910, Washington, DC. (OSHA 1991, 0610)

Annex IV

Records Management Project Plan



RECORDS MANAGEMENT PROJECT PLAN

This work plan will follow the Records Management Program Plan provided in Annex IV of Revision 3 of the Installation Work Plan (LANL 1993, 1017).

REFERENCE

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

Annex V

Public Involvement Project Plan

PUBLIC INVOLVEMENT PROJECT PLAN

This work plan will follow the Public Involvement Program Plan provided in Annex V of Revision 3 of the Installation Work Plan (LANL 1993, 1017). The Laboratory's public reading room is located at 1450 Central Avenue, Suite 101, Los Alamos, New Mexico. The public involvement project leader can be reached at (505) 665-5000 for additional information.

REFERENCE

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)

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Appendix A

Cultural Resource Summary

OU 1136 CULTURAL RESOURCE SUMMARY

As required by the National Historic Preservation Act of 1966 (as amended), a cultural resources survey was conducted during the summers of 1992 and 1993 at Operable Unit (OU) 1136. The methods and techniques used for this survey conform to those specified in the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (Federal Register Vol. 48, No. 190, September 29, 1983).

No archaeological sites are located in the area surveyed.[1]

A report documenting the survey area, methods, results, and monitoring recommendations, if any, will be transmitted to the New Mexico State Historic Preservation Officer for his concurrence in a "Determination of No Effect" for this project. As specified in 36 CFR 800.5(b) and following the intent of the American Indian Religious Freedom Act, a copy of this report will also be sent to the governor of San Ildefonso Pueblo and to any other interested tribal group for comment on possible impacts to sacred and traditional places. This consultation will be documented and included in environmental restoration (ER) files when it is completed.

All monitoring and avoidance recommendations contained in the reports referenced below must be followed by all personnel involved in ER sampling activities. The Environmental Protection Group (ESH-8) archaeologists must be contacted 30 days before initiation of any ground-breaking activities so that monitoring and avoidance recommendations can be verified.

REFERENCES

Larson, Beverly M., et al., in preparation. "Environmental Restoration Program, Operable Unit 1136, Cultural Resource Survey Report," Los Alamos National Laboratory, Los Alamos, New Mexico.

Larson, Beverly M., in preparation. "Traditional and Cultural Places Consultation Report," Los Alamos National Laboratory, Los Alamos, New Mexico.

[1] This information being verified as of 11/23/93. If there are any changes, we will rewrite this summary. The recommendations will not change, however.

Appendix B

Biological Resource Summary

BIOLOGICAL RESOURCE SUMMARY FOR TA-43, OPERABLE UNIT 1136

1.0 INTRODUCTION

During 1993, field surveys were conducted by the Biological Resource Evaluations Team (BRET) of the Environmental Protection Group (EM-8) for Operable Unit (OU) 1136, Technical Area (TA) 43 (site characterization). Site characterization requires surface and subsurface sampling within TA-43 and Los Alamos Canyon. Further information concerning the biological field surveys for OU 1136 is contained in the full report, Biological Assessment for Environmental Restoration Program, OU 1136 (Salisbury in preparation, 23-0097). The biological assessment will contain specific information on survey methods, results, and mitigation measures. This assessment will also contain information that may aid in defining ecological pathways and vegetation restoration.

2.0 LAWS

Field surveys were conducted for compliance with the amended Federal Endangered Species Act of 1973, New Mexico's Wildlife Conservation Act, New Mexico Endangered Plant Species Act (New Mexico Natural Resources Department 1985, 0546), Executive Order 11990 "Protection of Wetlands" (The White House 1977, 0635), Executive Order 11988 "Floodplain Management" (The White House 1977, 0634), 10 CFR 1022 "Compliance with Floodplain/Wetland Environmental Review Requirements" (DOE 1979, 0633), and US Department of Energy (DOE) Order 5400.1 (DOE 1988, 0075).

3.0 METHODS

The purpose of the surveys was three-fold. The first was to determine the presence or absence of critical habitat for any state or federal sensitive, threatened, or endangered plant or animal species within OU 1136 boundaries. Secondly, surveys were conducted to identify the presence or absence of sensitive areas such as flood plains and wetlands that may be present within the areas to be sampled and the extent of the areas and general characteristics. The third purpose was to provide additional plant and wildlife data concerning the habitat types within OU 1136. These data provide further baseline information about the biological components of the site for site characterization and determination of pre-sampling conditions. This information is also necessary to support the National Environmental Policy Act documentation and determination of a Categorical Exclusion for the sampling plan for site characterization (SEN-15-90).

OU 1136 personnel propose to collect sediment samples and surface and subsurface samples. The sediment samples are to be taken from existing sediment basins within drainages located in the OU. Soil samples will be collected from surface and subsurface. Subsurface characterization may involve trenching to depths of 30 ft.

After searching the database maintained by EM-8, containing the habitat requirements for all state and federally listed threatened or endangered plant and animal species known to occur within the boundaries of Los Alamos National Laboratory and surrounding areas, a habitat evaluation survey (Level 2) was conducted. A Level 2 survey is performed when there are areas that are not highly disturbed and could potentially support threatened or endangered species. Techniques used in a Level 2 survey are designed to gather data on the percent cover, density, and frequency of both the understory and overstory components of the plant community.

The habitat information gathered through the field surveys was then compared to the requirements for species of concern as identified in the database search. If habitat requirements were not met, then no further surveys were conducted and the site was considered cleared for impact on state and federally listed species. If habitat requirements were met, species surveys were done in accordance with pre-established survey protocols. These protocols often require certain meteorological or seasonal conditions.

In each location, all wetlands and flood plains within the survey area were noted using National Wetlands Inventory maps and field checks. Characteristics of wetlands, flood plains and riparian areas are noted using criteria outlined in the Corps of Engineers Wetlands Delineation Manual (1987, 0871).

4.0 SPECIES IDENTIFIED

TABLE B-1

THREATENED AND ENDANGERED SPECIES POTENTIALLY OCCURRING IN OPERABLE UNIT 1136

SCIENTIFIC NAME	COMMON NAME	STATUS	HABITAT
ANIMALS			
Accipiter gentilis	Northern goshawk	FCC2	Ponderosa pine/Gambel oak, ponderosa pine/gray oak, mixed conifer
Buteogallus anthracinus	Common black hawk	SPG2	Riparian areas with cottonwoods
Cynanthus latirostris	Broad-billed hummingbird	SPG2	Riparian woodland
Empidonax traillii	Willow flycatcher	FCC2 SPG2	Riparian areas with cottonwoods
Euderma maculatum	Spotted bat	FCC2 SPG2	Ponderosa, piñon-juniper, cliffs and rock crevices
Falco peregrinus	Peregrine falcon	FE SPG1	Ponderosa-piñon, cliffs and rock outcrops on cliffs
Haliaeetus leucocephalus	Bald eagle	FE SPG2	Riparian areas near streams and lakes
Ictinia mississippiensis	Mississippi kite	SPG2	Riparian and shelter belts
Plethodon neomexicanus	Jemez Mountains salamander	FCC2 SPG2	Spruce-fir, 7,225–9,250 ft, cool, moist, and shaded woods
Strix occidentalis lucida	Mexican spotted owl	FPT	Mixed conifer, mountains and canyons, uneven-aged, multi-storied forest with closed canopy
Zapus hudsonius	Meadow jumping mouse	FCC2 SPG2	Grassy areas dominated by grasses and rushes next to permanent running water
PLANTS			
Epipactis gigantea	Helleborine orchid	SPG1	Riparian areas, 6,000–8,500 ft
Lilium philadelphicumvar. andium	Wood lily	SE3	Ponderosa to mixed conifer, 6,000–10,000 ft
Phlox caryophylla	Pagosa phlox	SS	Ponderosa-piñon, 6,500–7,500 ft, open slopes in open woods

Status

FE Federally endangered. Any species that is in danger of extinction throughout all or a significant portion of its range other than a species of class insecta determined by the Secretary of the Interior to constitute a pest whose protection under the provision of the Endangered Species Act would present an overwhelming and overriding risk to man (USFWS 1988, 23-0098).

FPT Federally proposed as threatened. Taxon that has been proposed for listing under the Endangered Species Act as threatened. These species receive the protection of the Endangered Species Act during the proposal process (USFWS 1988, 23-0098).

FCC2 Federal candidate as a C2. Taxon for which information now in the possession of the USFWS indicates that proposing to the list as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat are not currently available to support a proposed rule. Further information is needed before listing. Federal agencies are requested to evaluate C2 species in their management activities (USFWS 1988, 23-0098).

SE3 State protected plant, widespread in or adjacent to New Mexico, but its numbers are being significantly reduced to such a degree that its survival within New Mexico is jeopardized (New Mexico Natural Resources Department 1985, 0546).

SPG1 State endangered as a Group 1 species. Species listed under New Mexico's Wildlife Conservation Act whose prospects of survival or recruitment within the state are in jeopardy.

SPG2 State endangered as a Group 2 species. Species listed under New Mexico's Wildlife Conservation Act whose prospects of survival or recruitment within the state are likely to become jeopardized in the foreseeable future.

SS State sensitive species.

5.0 RESULTS AND MITIGATION

5.1 Environmental Setting

The mesa top portion of OU 1136 lies within a developed area consisting of buildings, parking lots, and roads. No Level 2 surveys were conducted in these developed and disturbed areas. However, portions of this OU lie in Los Alamos Canyon where Level 2 surveys were conducted.

Results of the Level 2 surveys conducted within OU 1136 (Los Alamos Canyon) indicate the forested area is dominated by Ponderosa pine (*Pinus ponderosa).* Douglas fir (*Pseudotsuga menziesii*) is also found on the slopes of the canyon. The dominant shrub species is oak [Gambel (*Quercus gambelii*) and Wavy leaf (*Quercus undulata*)]. Percent canopy cover of the overstory species ranges from 32 to 50%.

The understory within this portion of the canyon is characterized by numerous grasses, including mountain muhly (*Muhlenbergia montana*), brome grass (*Bromus* species), bluegrass (*Poa* species), redtop (*Agrostis alba*), and a variety of composites and other forbs. The grass cover for this portion of the canyon in OU 1136 ranges from 7.2 to 8.4 %. Forb cover ranges from 6.0 to 2.4%.

Results of Level 1 surveys, Level 2 surveys, and previous studies indicate OU 1136 is home to 71 bird species, 32 mammal species, and at least 5 amphibians or reptile species.

5.2 Threatened and Endangered Species

Level 2 surveys indicated that habitat exist in Los Alamos Canyon for the helleborine orchid and the wood lily. During the survey effort, these species were not found. However, survey time may not have coincided with the flowering or emerging dates of these species. If sampling is to occur within Los Alamos Canyon, BRET must be provided with specific sampling site locations. These data will help to determine the necessity for surveying for the wood lily or helleborine orchid.

As a result of a habitat evaluation and previous data on OU 1136, at least five animal species have potential for occurrence within or near this OU. These are the goshawk (*Accipiter gentilis*), meadow jumping mouse (*Zapus* *hudsonius*), Jemez Mountains salamander (*Plethodon neomexicanus*), Mexican spotted owl, (*Strix occidentalis lucida*), and the spotted bat (*Euderma maculatum*). These species are discussed in more detail below. The remaining animal species are dismissed from further consideration because of lack of specific suitable habitat components.

The northern goshawk is found in dense, mature or old growth, coniferous forest. The highest percentage of nests in Los Alamos County are in ponderosa pine/Gambel oak, ponderosa pine/gray oak, and mixed conifer (*Abies concolor-Pseudotsuga menziesii-Pinus ponderosa/Quercus gambelii*) habitat types (Kennedy 1986, 1098). All of the above habitat types are represented in OU 1136. The following measures must be taken to avoid adverse impact to goshawks:

1. Any machine sampling occurring within Los Alamos Canyon between May and October must be cleared through BRET. BRET must be conducted 60 days prior to sampling to evaluate possible nest sites in and around the specific sampling area.

2. If any area within Los Alamos Canyon over one-tenth acre will be disturbed, contact BRET for a pre-sampling site-specific survey.

3. Any tree removal (live or snag) must be approved by BRET.

The Jemez Mountains salamander has been reported in Los Alamos Canyon near the bridge (Ramotnik 1986, 1100). The salamander requires downed, decayed conifer trunks or rocks (talus slopes) in mixed conifer forests. Moist slopes and moderate to heavy overstory cover also are necessary for this small amphibian's survival. Ramotnik recognized Los Alamos, Pajarito, Water, and Valle Canyons as a population center for this amphibian. This is one of three populations which could serve as "refuges to protect (Jemez Mountains) salamanders from significant loss of habitat because of logging, fire or insect damage, and maintain genetically viable populations" (Ramotnik 1986, 1100). The following measures must be taken to avoid adverse impact to the salamander.

1. Activity will not be permitted on canyon slopes or bottom when soil moisture is high.

2. Vehicular traffic, activities causing increased topsoil disturbance, and removal of forest litter should be avoided in potential salamander habitat.

3. BRET must be notified 60 days prior to sampling in Los Alamos Canyon or on canyon slopes to evaluate the need for a salamander survey. NOTE: because of strict state survey protocols, if a survey is deemed necessary, it can be conducted only in the summer months after several days of heavy rain (July or August). Sampling for site characterization could not begin until this survey is completed.

The spotted bat (*Euderma macalatum*) is found in piñon-juniper, ponderosa pine, mixed conifer, and riparian habitats. The two critical requirements for the spotted bat are a source of water and roost sites (caves in cliffs or rock crevices). Los Alamos Canyon should have a sufficient number of roost sites, but water sources with large pools are somewhat limited. To date, no spotted bats have been mist-netted on Laboratory property. Mist netting has been placed below and above OU 1136 in Los Alamos Canyon. Because of the nature and extent of the proposed site characterization in the canyon bottoms, no potential impacts to spotted bats will occur if small caves are not disturbed and water sources in the canyon bottoms are not altered.

The meadow jumping mouse surveys were conducted in the stream areas of Los Alamos Canyon. The jumping mouse is found within habitats consisting of a variety of wet grasses and sedges, along permanent streams. Joan Morrison, state expert on the jumping mouse, evaluated the habitat in Los Alamos Canyon (Morrison 1990, 1099). She reported that areas in Los Alamos Canyon were a potential habitat for the meadow jumping mouse. During the summer of 1992, a trapping grid was set up in Los Alamos Canyon just west of the bridge. Trapping was done for four nights; no meadow mice were found. However, more survey information is needed to determine if this area supports meadow jumping mice. The following measure must be taken to avoid adverse impact to meadow jumping mice:

BRET must be contacted 60 days prior to site characterization activities involving disturbance of stream-side vegetation or wet meadows to evaluate the need for a meadow jumping mouse survey. Surveys can be performed only in July.

The Mexican spotted owl inhabits forested mountains and canyons. Its habitat is primarily uneven-aged, multistory forest with closed canopies. Field data collected in Los Alamos Canyon indicate the canopy may be too open for the owl. However, all other habitat components are present. Mexican spotted owls are known to occur in Los Alamos County. Initial modeling performed by Terrell Johnson, state spotted owl expert, showed some areas of Los Alamos Canyon to be suitable for owl perching (Johnson 1992, 1097). The following measures must be taken to avoid adverse impacts to the Mexican spotted owl:

1. Any machine sampling occurring within Los Alamos Canyon between May and October must be cleared through BRET. BRET must be contacted 60 days prior to sampling to evaluate possible nest sites in and around the specific sampling area.

2. If any area within Los Alamos Canyon over one-tenth acre will be disturbed, contact BRET for a pre-sampling site-specific survey.

3. Any tree removal (live or snag) must be approved by BRET.

5.3 Wetlands/Flood Plains

Both flood plains and wetlands are located within OU 1136 in Los Alamos Canyon. Wetlands areas in Los Alamos Canyon have been mapped by the US Fish and Wildlife Service (USFWS) as intermittent riverine areas. USFWS uses a hierarchical system of classification and is determined solely by aerial photography. These areas may be classified as jurisdictional wetlands. Flood plain maps developed by McLin (1992, 0825) indicate that a flood plain does exist within Los Alamos Canyon. In compliance with 10 CFR 1022, a flood plain/wetlands involvement notification will be submitted to the Federal Register for public comment. RFI activities are not anticipated to adversely affect the flood plains and wetlands within OU 1136 as long as best management practices outlined in Section 6.0 are adhered to.

6.0 BEST MANAGEMENT PRACTICES

Impacts to non-sensitive plants should be avoided when possible. Off-road driving is especially harmful to plants and soil crust. Vehicular travel should be restricted to existing roads whenever possible. If off-road travel is required, ESH-8 (formerly EM-8) should be contacted to monitor the activity. Revegetation may be required at some sites. A list of native plants suitable for revegetation at OU 1136 is contained in the final report Biological Assessment Restoration Program, OU 1136.

The following best management practices apply only to Los Alamos Canyon.

- Any machine sampling occurring within Los Alamos Canyon between May and October must be cleared through BRET. BRET must be contacted 60 days prior to sampling to evaluate possible nest sites in and around the specific sampling area.

- If any area within Los Alamos Canyon over one-tenth acre will be disturbed, contact BRET for a pre-sampling site specific survey.

- Any tree removal (live or snag) must be approved by BRET.

- Avoid unnecessary disturbance (e.g., parking areas, equipment storage areas, off-road travel) to vegetation during sampling and travel to sampling sites.

- Activity will not be permitted when the soil surface has a high moisture content.

REFERENCES

Army Corps of Engineers, January 1987. "Corps of Engineers Wetlands Delineation Manual," final report, Technical Report Y-87-1, Wetlands Research Program, Waterways Experiment Station, P. O. Box 631, Vicksburg, Mississippi. (Army Corps of Engineers 1987, 0871)

DOE (US Department of Energy), March 7, 1979. "Compliance with Floodplain/Wetlands Environmental Review Requirements," Final Rule, 10 CFR Part 1022, Federal Register, Vol. 44, No. 46, p. 12594. (DOE 1979, 0633)

DOE (US Department of Energy), November 9, 1988. "General Environmental Protection Program," DOE Order 5400.1, Washington, DC. (DOE 1988, 0075)

Johnson, T. H., February 1992. "R-30 Peregrine Falcon Habitat Management Plan," prepared for Los Alamos National Laboratory. (Johnson 1992, 1097)

Kennedy, P., 1988. "Habitat Characteristics of Cooper's Hawks and Northern Goshawks Nesting in New Mexico," *Proceedings of the Southwest Raptor Management Symposium and Workshop*, sponsored by National Wildlife Federation, Port City Press, Baltimore, Maryland. (Kennedy 1986, 1098)

McLin, S. G. 1992. "Determination of 100-Year Floodplain Elevations at Los Alamos National Laboratory," Los Alamos National Laboratory Report LA-12195-MS, Los Alamos, New Mexico. (McLin 1992, 0825)

Morrison, J. L., 1990. "The Meadow Jumping Mouse in New Mexico: Habitat Preferences and Management Recommendations," in *Managing Wildlife in the Southwest*, P. Krausman and N. Smith (Eds.), The Wildlife Society, Phoenix, Arizona. (Morrison 1990, 1099)

New Mexico Natural Resources Department, 1985. "Endangered Plant Species in New Mexico," Rule No. NRD:85-3. Santa Fe, New Mexico. (New Mexico Natural Resources Department 1985, 0546)

Ramotnik, C. A. July 1986. "Status Report, *Plethodon Neomexicana*, Jemez Mountains Salamander, " U.S Fish and Wildlife Service, National Ecology Center, Fort Collins, Colorado. (Ramotnik 1986, 1100)

Salisbury in preparation. "Biological Assessment for the Environmental Restoration Program, Operable Unit 1136," Los Alamos National Laboratory Report, Los Alamos, New Mexico. (Salisbury in preparation, 23-0097)

The White House, May 24, 1977. "Floodplain Management," Executive Order 11988, in Environment Reporter, The Bureau of National Affairs, Inc., Washington, DC. (The White House 1977, 0634)

The White House, May 24, 1977. "Protection of Wetlands," Executive Order 11990, in Environment Reporter, The Bureau of National Affairs, Inc., Washington, DC. (The White House 1977, 0635)

Secretary of Energy Notice, February 5, 1990. National Environmental Policy Act. (SEN-15-90)

USFWS (US Fish and Wildlife Service), 1988. "Endangered Species Act of 1973 as Amended through the 100th Congress (Public Law 100-478), US Department of the Interior, Washington, DC. (USFWS 1988, 23-0098)

Appendix C

List of Contributors

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Marge Boettner (Bethco, Inc.)	B.S. English Education 4 years experience as a technical writer/editor	Technical writer/editor
Dow Davidson (EES-4)	B.A. Anthropology 15 years experience in quality assurance/sample management	Development and incorporation of sampling plans
Terry Foxx (ESH-8)	M.S. Environmental Science, B.S. Biology 3 years experience in performing biological field studies under ER and other programs	Baseline data for ecological risk and natural resource damage assessments
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Andrea Kron (cARTography by Andrea Kron)	B.A. Geology 18 years experience in cartography, geology, and technical illustration	Illustrations, flow charts, and tables
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Calvin Martell (Retired, CLS-1)	M.S. Analytical Chemistry 25 years experience in analysis of actinides, 3 years in design of plutonium laboratory, 1 year chemistry liaison to Rocky Flats, 2 years work in environmental restoration	Former Operable Unit 1136 Project Leader

NAME AND AFFILIATION	EDUCATION/EXPERTISE	ER PROGRAM ASSIGNMENT
Brad Martin (CST-6)	M.B.A, B.S. Electrical Engineering 22 years at LANL in Engineering (E-2, E-3) and group and division management (CLS-DO); 2 years as OUPL for OU 1082	Technical and administrative support
Dave McInroy (EM/ER)	B.S. Biology 9 years experience in waste management activities, including project management	Programmatic Project Leader, regulatory compliance
Eugene Potter (The Dephi Groupe/ ESH-12)	M.S. Nuclear Engineering Certified Health Physicist, 15 years experience in operational health physics and radiological risk assessment	Risk assessment technical team member
Brenda Pacheco (EM/ER)	7 years experience in word processing, 2 years experience in desktop publishing	Word processor
Steve Watanabe (CST-6)	B.S. Business Administration 2 years experience as Deputy OUPL for OU 1136, computer archivist	Former Deputy Operable Unit Project Leader, archival research, technical review

Appendix D

Field Investigation Approach and Methods

Executive Summary

Chapter 1
Introduction

Chapter 2
Background Information

Chapter 3
Environmental Setting

Chapter 4
Technical Approach

Chapter 5
Evaluation of Potential Release Sites

Chapter 6
PRSs Recommended for No Further Action or Deferred Action

Annexes

Appendices

1.0 GENERAL

This appendix describes common elements that apply to the conduct of field investigations at Operable Unit (OU) 1136 potential release sites (PRSs). General assumptions appy to the field investigations presented in Chapter 5 of this work plan. They include the following:

- Historical data, field surveys, and field screening of samples can be used to identify gross contamination and assist in sample selection for laboratory analyses (see Table D-1).
- Analytical laboratory analysis will complete the sampling planned at each phase of site investigation.

1.1 Field Operations

The sampling and analysis plan in Chapter 5 of this work plan represents the up-to-date results of research and investigation. The plan does not present the full level of detail necessary for complete field implementation. Specific detail will be added to the current sampling and analysis plan prior to going to the field for sample collection.

A standard table is used in this work plan to identify screening and analysis requirements, including the number of samples and types of analyses needed (Table D-2). A step-by-step approach to the collection of sample data is used at OU 1136 and, therefore, not every sample or every analyte listed on the sampling and analysis summary table is applicable.

A complete readiness review will be conducted prior to initiation of the field investigation portion of the OU 1136 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). This review will ensure that archaeological and ecological evaluations will be performed in all areas where the surface is to be disturbed, vegetation removed, or invasive sampling performed.

This discussion identifies several aspects of the Laboratory's implementation of the field sampling process that are not mentioned in the specific sampling and analysis plans. Standard field operations include (see Section 2.0, Field Operations Management):

TABLE D-1

POTENTIAL CONTAMINANTS OF CONCERN AT OU 1136

POTENTIAL CONTAMINANTS OF CONCERN	LAB METHOD	LAB PQL	FIELD SCREEN METHOD	FIELD SCREEN PQL	LANL BACKGROUND IN SOIL	SAL IN SOIL
Metals						
Silver	6010	0.7 ppm	NA	NA	1.61 ppm	400 ppm
Organics						
Chloroform	8260	5 ppb[a]	PID	0.1-2 ppm [b]	0	0.21 ppm
Toluene	8260	5 ppb[a]	PID	0.1-2 ppm [b]	0	890 ppm
Xylene	8260	5 ppb[a]	PID	0.1-2 ppm [b]	0	160,000 ppm
Inorganics						
Cyanide	9010	5 ppm	NA	NA	0	1,600 ppm
Radionuclides						
Carbon-14	liquid scintillation	1000 pCi/g[c]	NA	NA	TBD	4.7×10^5 pCi/g
Cesium-137	γ spec	0.1 pCi/g[d,e]	μR meter	30-60 pCi/g[f]	0.01-0.82 pCi/g	4 pCi/g
Cobalt-60	γ spec	0.1 pCi/g[d,e]	μR meter	17-37 pCi/g[f]	TBD	0.90 pCi/g
Hydrogen-3 (tritium)	liquid scintillation	0.003 pCi/g[g]	NA	NA	TBD	1.5×10^7 pCi/g
Plutonium-238	α spec	0.005 pCi/g[h]	FIDLER	>100 nCi/m^2	<0.01 pCi/g	27 pCi/g
Plutonium-239	α spec	0.005 pCi/g[h]	FIDLER	100 nCi/m^2	<0.01-0.07 pCi/g	24 pCi/g
Strontium-90	gas proportional	2.0 pCi/g[d]	GM with pancake	700 pCi/100 cm^2 [i]	TBD	8.9 pCi/g
Uranium-235	α spec	0.05 pCi/g[d]	Phoswich	35 pCi/g	0.008-0.37 pCi/g [j]	18 pCi/g
Uranium-238	γ spec	0.1 pCi/g[d]	Phoswich	35 pCi/g	0.17-0.8 pCi/g [j]	59 pCi/g

Notes:

FIDLER = field instrument for detection of low-energy radiation.
GM = Geiger-Mueller detector.
NA = not available.
pancake = flat, thin-window probe for detecting beta-gamma contamination.
PID = photoionization detector.
PQL = practical quantitation limit.

a. PQLs listed for soil/sediment are based on net weight. Normally data are reported on a dry weight basis; therefore, PQLs will be higher, based on the percent moisture in each sample.

b. Values are for air concentration and correspond to the lowest scale one the instrument. The detection limit depends on the specific calibration gas or vapor used.

c. The Laboratory does not have an in-house method. The value given is an estimate of the PQL, which should be readily achievable by a contract lab.

d. EML Procedures Manual HASL-300, US DOE, Environmental Measurements Laboratory, 26th ed., 1983. The detection limits listed are the method detection limits. Lower detection limits can be achieved with larger sample aliquots, additional chemistry, and extended counting times.

TABLE D-1 (continued)

POTENTIAL CONTAMINANTS OF CONCERN AT OU 1136

e. The detection limit is dependent on the mixture of isotopes in the sample.

f. Calculated for measurements taken at 1 meter, assuming an infinite depth and lateral extent of the contaminated zone, a soil density of 1.6 g/cm^3, and that 1-2 times the Laboratory's gamma background could be distinguished from local background. The instrument was assumed to be calibrated to Cs-137, and the response to C0-60 was assumed to be 40% of the Cs-137 response. For small "hot spots" the PQL would be higher.

g. Table C-26, Detection Limits for Analysis of Typical Environmental Samples, Environmental Surveillance at Los Alamos During 1990, LANL Report LA-12271-MS.

h. LANL Methods Manual LA-10300-M. The detection limits listed are the method detection limits. Lower detection limits can be achieved with larger sample aliquots, additional chemistry, and extended counting times.

i. Calculated gross beta response for a GM detector with pancake probe.

j. Calculated from the range of total uranium reported for the "A" soil horizon at the Laboratory in memorandum from Patrick Longmire, March 21, 1994, Subject: Background Soil Chemical Data Using EPA SW846 Procedures.

- preliminary activities and support procedures required by the Los Alamos National Laboratory (the Laboratory);
- identifying and documenting locations that have been sampled;
- field sample logging, handling, and documentation;
- analytical sample handling and sample coordination facility laboratory coordination procedures;
- equipment decontamination procedures; and,
- management of wastes generated by sampling and decontamination activities.

1.2 Investigation Methods

This appendix focuses on field investigation methods discussed in the field sampling methods subsection of the Laboratory's Installation Work Plan (IWP), Subsection 4.4 (LANL 1993, 1017). The methods presented here are

TABLE D-2

SUMMARY OF OU 1136 SITE SURVEYS, SAMPLING, AND ANALYSIS

OU-1136

Summary of OU 1136
Site Surveys,
Sampling and Analysis

Sample Structure Total 0
Sample Surface Total 13
Sample Subsurface Total 0

	PRS	PRS Type	Phase 1 Approach	Field Surveys: Land Survey	Field Surveys: Geophysics	Field Surveys: Radiation	Samples: Sampled Media	Samples: Structure	Samples: Surface	Samples: Surface PE*	Samples: Subsurface	Field Screening: Gross Alpha	Field Screening: Gross Gamma/Beta	Field Screening: Organic Vapor	Field Screening: X-Ray Florescence	Laboratory Analyses: Gamma Spectroscopy	Isotopic Uranium	Isotopic Plutonium	Isotopic Thorium	VOA (SW8240)	Semivolatiles (SW8270)	TCLP Metals	Metals (SW 6010)	PCB (SW 8080)	Abestos	Mercury	Cyanide
(1)	C-43-001	Storm Drain Outfall	Screening Assessment	x		x	Soil/Tuff	0	3	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
(2)	43-001(b2)	NPDES Outfall	Screening Assessment	x		x	Soil/Tuff	0	3	0	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
(3)	43-001(a1)	Sanitary Sewer Line	Screening Assessment	x	x	x	Soil/Tuff	0	3	1	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
(4)	43-001(a1)	Sanitary Sewer Line	Screening Assessment	x	x	x	Sediment	0	3	0	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
(5)	43-001(a1)	Sanitary Sewer Line	Screening Assessment	x	x	x	Sediment	0	1	0	0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

*PE = performance evaluation.

specific examples of the options identified in the IWP. In addition, this appendix references the Laboratory's Environmental Restoration (ER) Program standard operating procedures (SOPs) (LANL 1993, 0875). Each brief method description given herein refers to the applicable SOPs for detailed methodology.

The method descriptions are concise and provide some information on application of the method. Specific information, such as sampling location or target depth of a borehole, is provided by the sampling and analysis plan in Chapter 5 of this work plan. The method descriptions presented here are not intended to supplant or reduce the importance of the Quality Assurance Project Plan (Annex II) of this work plan or the governing SOPs (LANL 1993, 0875). Wherever a Laboratory ER Program SOP is referenced in this work plan, revision numbers are intentionally not listed. Most SOPs will undergo revision between the completion of this work plan and commencement of field activities. Therefore, the most current revision will be used at the time that activities requiring implementation of the SOP are undertaken. Table D-3 lists the SOPs applicable to the OU 1136 Work Plan.

TABLE D-3

STANDARD OPERATING PROCEDURES CITED FOR OU 1136 FIELD ACTIVITIES

TITLE	NUMBER
General Instructions for Field Investigations	LANL-ER-SOP-01.01
Sample Containers and Preservation	LANL-ER-SOP-01.02
Handling, Packaging, and Shipping of Samples	LANL-ER-SOP-01.03
Sample Control and Field Documentation	LANL-ER-SOP-01.04
Field Quality Control Samples	LANL-ER-SOP-01.05
Management of RFI-Generated Waste	IN PREPARATION
Equipment Decontamination	LANL-ER-SOP-01.08
Near Surface Soil Sample Screening for Low-Energy Gamma Radiation Using the FIDLER	LANL-ER-SOP-10.04
Near Surface Soil Sample Screening for Low-Energy Gamma Radiation Using the Phoswich	IN PREPARATION
Measurement of Gamma Radiation Using Sodium Iodide (NaI) Detector	LANL-ER-SOP-06.23
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-06.10
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
Sediment Material Collection	LANL-ER-SOP-06.14

2.0 FIELD OPERATIONS MANAGEMENT

Multiple field investigation teams may be operating concurrently during the RFI. Each team will be responsible for health and safety, sample identification and traceability, and related activities. Several aspects of field operations are described that will occur as a part of all field operations. Other responsibilities may be shared between field teams, such as operation of the portable sample logging facility or of an equipment decontamination facility.

2.1 Health and Safety

Annex III of this work plan is the Health and Safety Project Plan for all field activities within OU 1136. The plan gives specific information regarding known or suspected contaminants. Samples acquired as part of this work plan will be screened at the point of collection to identify the presence of gross contamination or conditions that may pose a threat to the health and safety of field personnel. The techniques listed in Section 5.0, Field Screening, will be used.

Access, staging, and sample storage areas will be designated by the field team leader (FTL). In order to maintain sample integrity and sample documentation, all sampling sites will be included in one or several exclusion zones. Exclusion zones will be delineated by the FTL with the concurrence of the site safety officer (SSO). The boundary of an exclusion zone will be defined based on the nature, magnitude, and extent of confirmed or possible contamination; the potential for contaminant migration; hazards at the site, such as use of mechanical equipment; the presence of electrical lines or other utilities, structures, tanks, pits, or trenches; and, the presence of steep banks or cliffs.

Boundaries of exclusion zones may be changed as operations progress. All changes will be designated by the FTL, with the concurrence of the SSO.

In order to ensure sample integrity, to maintain control over sampling waste, and to avoid contamination of the site office, decontamination may be required for personnel, equipment, and vehicles moving from one zone to another. Therefore, a contamination reduction zone (CRZ) will be established surrounding the exclusion zone(s). A contamination reduction corridor, the size of which will depend on the number of stations required for decontamination activities, will be established through the CRZs. The corridor should be located in a direction that is generally upwind from the exclusion zone.

2.2 Site Monitoring

Entry to, and egress from, sites will be controlled for monitoring purposes. All personnel entering the sites must use appropriate radiation monitoring badges. Locations for drinking water, rest room facilities, etc., will be identified prior to beginning on-site activities. Protective clothing requirements will be determined by the SSO assigned to the project.

Field measurements for wind-borne contaminants will be made and documented prior to, during, and after surface sampling activities. Qualified health and safety personnel (or designees) are responsible for this monitoring. Results of monitoring will be used to evaluate possible hazards existing at the site in order to evaluate current conditions and specify personal protective equipment. In addition, all personnel will visually monitor for extreme weather conditions, lightning, or other physical or environmental hazards that may develop. Personnel will notify the SSO when unanticipated physical or environmental hazards develop.

2.3 Archaeological and Ecological Awareness

Before going into the field, the OU 1136 field teams will be briefed about the cultural and ecosystem sensitivities present at OU 1136. Field teams will abide by the mitigative measures prescribed for archaeological and ecological features or systems identified for OU 1136 (see Appendices A and B).

2.4 Support Services

Physical services support during the field investigation will be provided by Laboratory support groups [e.g., Engineering (Design Engineering Group, ENG-3; Field Operations Group, ENG-5) Johnson Controls World Services Inc., or other subcontractors]. Existing job ticket procedures will be used. The services these organizations will provide include, but are not limited to, backhoe and front-end loader excavations, moving pallets of drummed auger cuttings and decontamination solutions, and setting up signs and other warning notices around the perimeter of the working area.

2.5 Excavation Permits

As part of the Environment, Safety, and Health questionnaire process, excavation permits are required by the Laboratory prior to any excavation, drilling, or other invasive activity. Acquisition of the permits will be coordinated with the Laboratory's Facility Risk Management Group (ESH-3) and Johnson Controls World Services Inc. Acquisition of excavation permits will be scheduled as appropriate for each phase of fieldwork. All areas intended for excavation, drilling, or sampling will be marked in the field for formal clearance before beginning the work.

2.6 Sample Management

Regulatory requirements governing the ER Program mandate the implementation of sample controls as part of the quality assurance program. Traceability (chain-of-custody) of samples will be established by the maintenance of sample histories during collection, transportation, processing, testing, and storage activities. Appropriate processing of field samples before testing and analysis is necessary to ensure that data from samples are accurate, from collection in the field, to their distribution to the analytical laboratory or receipt at the ER Program's Sample Management Facility, and to their final storage or disposal.

The Sample Management Facility, established by the ER Program, ensures quality control of all geologic samples and associated records, including their physical protection and traceability. Guidance for sample handling is provided in Annex II of the IWP (LANL 1993, 1017). Sample packaging, handling, traceability, and documentation procedures are provided in ER Program SOPs. See Table D-3 for a complete listing of applicable SOPs.

2.7 Sample Coordination

A sample coordination facility has been established by the ER Program in the Laboratory's Environmental Chemistry Group (CST-9) to provide consistent and cost-effective analytical methods for all investigations. The system is described in Subsection 3.3.2.8 of the IWP (LANL 1993, 1017). The applicable SOP is LANL-ER-SOP-01.04, Sample Control and Field Documentation (LANL 1993, 0875).

2.8 Quality Control Samples

Field quality assessment samples of several types are collected during the course of a field investigation. The definition for each kind of sample and the purpose it is intended to fulfill are given in the Quality Assurance Project Plan, and in LANL-ER-SOP-01.05, Field Quality Control Samples (LANL 1993, 0875). The specific number of performance evaluation samples that are to be collected are listed in Table 5-2 and Table D-2 of this work plan.

2.9 Equipment Decontamination

Decontamination is performed as a quality assurance measure, an environmental protection activity, and a safety precaution. It prevents cross-contamination among samples and helps maintain a clean working environment for the safety of personnel. Sampling tools are decontaminated by washing, rinsing, and drying. The effectiveness of the decontamination process is documented through rinsate blanks submitted for laboratory analysis. Steam cleaning is used for large machinery, vehicles, auger flights, and coring tools used in borehole sampling. Decontamination wastewaters, including steam-cleaning fluids, must be collected and contained for proper disposal.

2.10 Waste Management

This discussion is based on the guidance provided in Subsection 4.5.2 and Appendix C of the IWP (LANL 1993, 1017). Wastes produced during sampling activities may include borehole auger cuttings, excess sample, excavated soil from trenching, decontamination wastewaters and steam-cleaning fluids, and disposable materials such as wipes, protective clothing, and sample bottles. In different areas of OU 1136, several of the following waste categories may be encountered: hazardous waste, low-level radioactive waste, and mixed waste. Requirements for segregating, containing, characterizing, treating, and disposing of each type and category of waste are provided in the applicable SOP, LANL-ER-SOP-01.06, Management of RFI-Generated Waste (LANL 1993, 0875).

3.0 FIELD SURVEYS

Field surveys will primarily consist of walking scans of the land surface using direct reading or recording instruments. Field survey data such as radioactivity or organic vapor measurements are used to identify the presence of contaminants or structures in the field and to modify health and safety plans. While negative results from field surveys are not conclusive evidence of the absence of contaminants, positive results obtained at an early stage can allow timely redirection of sampling activities.

3.1 Land Surveys

Land surveys will include engineering and geomorphologic mapping activities.

3.1.1 Engineering Mapping

Geodetic engineering mapping is required to accurately record the location of PRSs and surface and subsurface sampling points. In the field the engineering survey will locate, stake, and document all PRS locations (that can be ascertained before sampling) and all surface engineering features and structures. The assumed locations of subsurface structures will be surveyed based upon existing engineering drawings. These data will be recorded on a base map scaled 1:7,200. If repositioning a sample location becomes necessary during sample collection, this new position will be resurveyed and the revised location will be indicated on the base map.

3.1.2 Geomorphologic Mapping

Field or geomorphologic mapping will be required for OU 1136 to assist in the location of certain sampling points. In order to sample drainages judged most likely to contain potential contamination, several of the individual sampling plans in Chapter 5 required identification of drainages. See Table D-3 for information on the applicable SOPs.

4.0 SOIL SAMPLING

Soil samples, taken as described below, will be used for field screening, field laboratory, and analytical laboratory measurements and analyses. The following sections present the sampling techniques that may be used for sampling surface soils and sediments at OU 1136 PRSs. Applicable SOPs are listed in Table D-3.

4.1 Surface Soils: 0 to 18 in.

Small-volume soil samples can be recovered from depths approaching 10 ft with a hand auger or with a thin-wall tube sampler. The thin-wall tube sampler provides a less disturbed sample than that obtained with a hand auger. However, it may not be possible to force the thin-wall tube sampler through some soil or tuff. In this case, sampling with the hand auger may be the more viable alternative. It is usually not practical to use a hand auger or thin-wall tube sampler at depths below 10 ft. The applicable SOP is LANL-ER-SOP- 06.10, Hand Auger and Thin-Wall Tube Sampler (LANL 1993, 0875).

4.2 Sediment

Sediment samples will be collected from the interior of the abandoned sanitary sewer line. Several techniques are available for the collection of sludge and sediment samples, such as a spade and scoop, or Ponar grab. The most appropriate method will be selected by the FTL. The applicable SOP is LANL-ER-SOP-06.14, Sediment Material Collection (LANL 1993, 0875).

5.0 FIELD SCREENING

Field screening measurements are applied at the point of sample collection and in excavations to identify gross contamination and to assess conditions affecting the health or safety of field personnel. Individual sampling plans may not explicitly identify the use or role of sample screening measurements; however, the standard analytical table for each investigation will show the methods to be used (see Section 7.0 of this appendix).

In general, every sample taken at OU 1136 will be screened for alpha-, beta-, and gamma radioactivity. In addition to the role of sample screening to identify gross contamination or situations of concern for health and safety, field screening information will be used to direct sampling and to guide in the selection of analysis activities.

5.1 Radiological Screening

5.1.1 Gross-Alpha Radiological Screening

Field screening of samples for gross-alpha radioactivity is conducted using a hand-held alpha scintillation detector and a ratemeter. The detector is held close to contact with the sample and is capable of detecting on the order of approximately 100 to 200 pCi/g for a damp soil sample. The instrument cannot identify specific radionuclides.

5.1.2 Gross-Beta Radiological Screening

Field screening of samples for gross beta radioactivity is conducted using a hand-held detector. A typical beta detector consists of a Geiger-Müeller tube with a thin mica window protected by a sturdy wire screen. The mica window thickness may vary from 1.4 to 2 mg/cm^2. The detector is held close to contact with the sample or core and is capable of detecting gross beta activity down to 40 keV. The gamma sensitivity of such a detector is approximately 3,600 cpm/mR/h. The beta efficiency with screen in place is 45% for strontium-90 and 10% for carbon-14. Screen removal will increase efficiency by 45%. The efficiencies are determined as percentage of 2π emission rate, from a 1-in.-diameter source. This beta detector is alpha sensitive above 3 MeV.

5.1.3 Gross-Gamma Radiological Screening

Field screening of samples for gross-gamma radioactivity will be done using a hand-held NaI detector probe and ratemeter. The detector is held close to the sample and is capable of identifying elevated concentrations of certain radionuclides as an increased ratemeter reading above instrument background levels. Quantification of the response is difficult and is best interpreted as a gross indicator of potential contamination.

5.2 Nonradioactive Screening

5.2.1 Organic Vapor Detectors

Organic vapor detectors will be used to screen soil and sediment samples at the point of collection to identify grossly contaminated samples and to monitor breathing zones for personnel safety in sample collection and handling areas at OU 1136 sites. Two types of detectors, photoionization detector (PID) and flame ionization detector (FID), will be used to improve the probability of detecting a wide range of vapors as described below:

- PID. A Model PI 101 PID, or its equivalent, will be used. It is a general survey instrument capable of detecting real-time concentrations of many complex organic compounds and some inorganic compounds in air. The instrument can be calibrated to a particular compound; however, it cannot distinguish between detectable compounds in a mixture of gases. See Table D-3 for information on the applicable SOP.

- FID. A Foxboro Model OVA-128 FID, or its equivalent, will be used. It is a flame ionization detector that can be used as a general screening instrument to detect the presence of many organic vapors. Its response to an unknown sample is relative to the response to a gas of known composition to which the instrument has been calibrated. See Table D-3 for information on the applicable SOP.

- Combustible Gas/Oxygen Detector. A Gastech Model 1314 or its equivalent will be used to determine the potential for combustion or explosion of unknown atmospheres during drilling and intrusive activities. A typical combustible gas indicator (CGI) determines the level of organic vapors and gases present in an atmosphere as a percentage of the lower explosive limit or lower flammability limit. The Gastech Model 1314 also contains an oxygen detector to determine atmospheres that are deficient or enriched in oxygen. For health and safety purposes, the CGI will be used (if appropriate) to monitor atmospheres during some intrusive activities. See Table D-3 for information on the applicable SOP.

5.2.2 X-Ray Fluorescence Probe for Metals

X-ray fluorescence (XRF) is a technique for analyzing metals in solids. The instrument consists of a source for sample excitation (x-ray tube), a detector or proportional counter, a sample chamber, and an energy analyzer. The XRF instrument will be used for detection of metals on solid surfaces. Dried soil or crushed debris samples are placed in a sample chamber, excited, and counted for finite periods (such as 400 seconds). Detection limits for metals in soils must be low enough to ascertain whether action levels for metals in soil or debris will be exceeded. Even if action-level detection limits cannot be achieved in field instruments, gross concentrations of metals may be detected. This will be valuable information for soil or debris assessment. There is no ER SOP for XRF; calibration and field procedures recommended by the instrument manufacturer will be followed.

6.0 LABORATORY ANALYSIS

As described in Subsection 2.6 of this appendix, samples to be submitted to an analytical laboratory will be coordinated, handled, and tracked by the ER Program Sample Coordination Facility (CST-9).

The following list provides references for methods for the parameters that appear in the laboratory analysis columns of the screening and analysis summary table (see Section 7.0).

Gamma spectroscopy. Radionuclides will be quantified by measurement of photon emissions. Quantification limits are given in LANL-ER-QAPP, Table V.8 (LANL 1991, 0412).

Isotopic uranium. Chemical separation of plutonium from soil is followed by alpha spectrometry to quantify each isotope of uranium. Quantitation limits are given in LANL-ER-QAPjP, Table V.8 (LANL 1991, 0412).

Volatile organic compounds. According to CST-9 subcontracts, which use methods similar to SW-8260.

Semivolatile organic compounds. According to CST-9 subcontracts, which use methods similar to SW-8270.

Metals. According to CST-9 subcontracts, which use methods similar to SW-6010 with appropriate sample preparation procedures.

7.0 SCREENING AND ANALYSIS SUMMARY TABLE

A standard table is used in this work plan to identify screening and analysis requirements, including the number of samples and types of analyses needed. Table D-2 is the screening and analysis summary table referred to in several sections of this annex.

7.1 PRS and Investigation Approach

Table D-2 identifies, by PRS, the PRS type (a brief description of the PRS) and the investigative approach at this PRS sampling to support a screening assessment decision.

7.2 Field Surveys

Field surveys identified in Table D-2 are primarily geodetic engineering mapping activities or walking surveys of the land surface, using direct reading or recording instruments. For OU 1136 these surveys will include land, geophysical, and radiation surveys.

7.3 Samples

Table D-2 identifies samples and performance evaluation samples (see Subsection 2.8 of this appendix, Quality Control Samples). Individual columns indicate whether samples are to be collected from structures, surface, or subsurface, but sampling techniques may yield cross samples. Hand auger samples, for example, will always yield a surface component in addition to the near-surface and subsurface component. Single or multiple specimens may be created from a sample. For example, a soil sample collected in the field will normally represent only one sample, whereas a subsurface core will provide many samples. This section of the table includes a column to identify the sampled media (i.e., soil, tuff, sediment) and the numbers of samples and quality duplicates collected for each PRS or sampling unit.

7.4 Field Screening

Table D-2 indicates the field screening methods to be used. Field screening measurements are taken at the point of sample collection, in borehole headroom, and in excavations to identify gross contamination and to assess conditions affecting health and safety of field personnel. Specific field screening categories at OU 1136 include; gross alpha, -beta, and -gamma, organic vapors, and XRF.

7.5 Laboratory Analysis

Table D-2 designates full laboratory analyses that are to be performed on samples. The lack of existing data from a PRS creates the need to verify the presence of a wide spectrum of possible contaminants. Analytical laboratories that are not located in the field are expected to provide the highest quality data; all samples submitted to an analytical laboratory will be handled and tracked by the ER Program Sample Coordination Facility. See Section 6.0 for a complete list of the laboratory analysis methods that will be performed at OU 1136.

REFERENCES

LANL (Los Alamos National Laboratory), May 1991. "Generic Quality Assurance Project Plan for RCRA Facility Investigations for the Los Alamos National Laboratory Environmental Restoration Program," Revision 0, Los Alamos National Laboratory report, Los Alamos, New Mexico. (LANL 1991, 0412)

LANL (Los Alamos National Laboratory), January 1993. "Environmental Restoration Standard Operating Procedures," Los Alamos, New Mexico. (LANL 1993, 0875)

LANL (Los Alamos National Laboratory), November 1993. "Installation Work Plan for Environmental Restoration," Revision 3, Los Alamos National Laboratory Report LA-UR-93-3987, Los Alamos, New Mexico. (LANL 1993, 1017)